FEBRUARY 21, 1931

Railway Age

Founded In 1856

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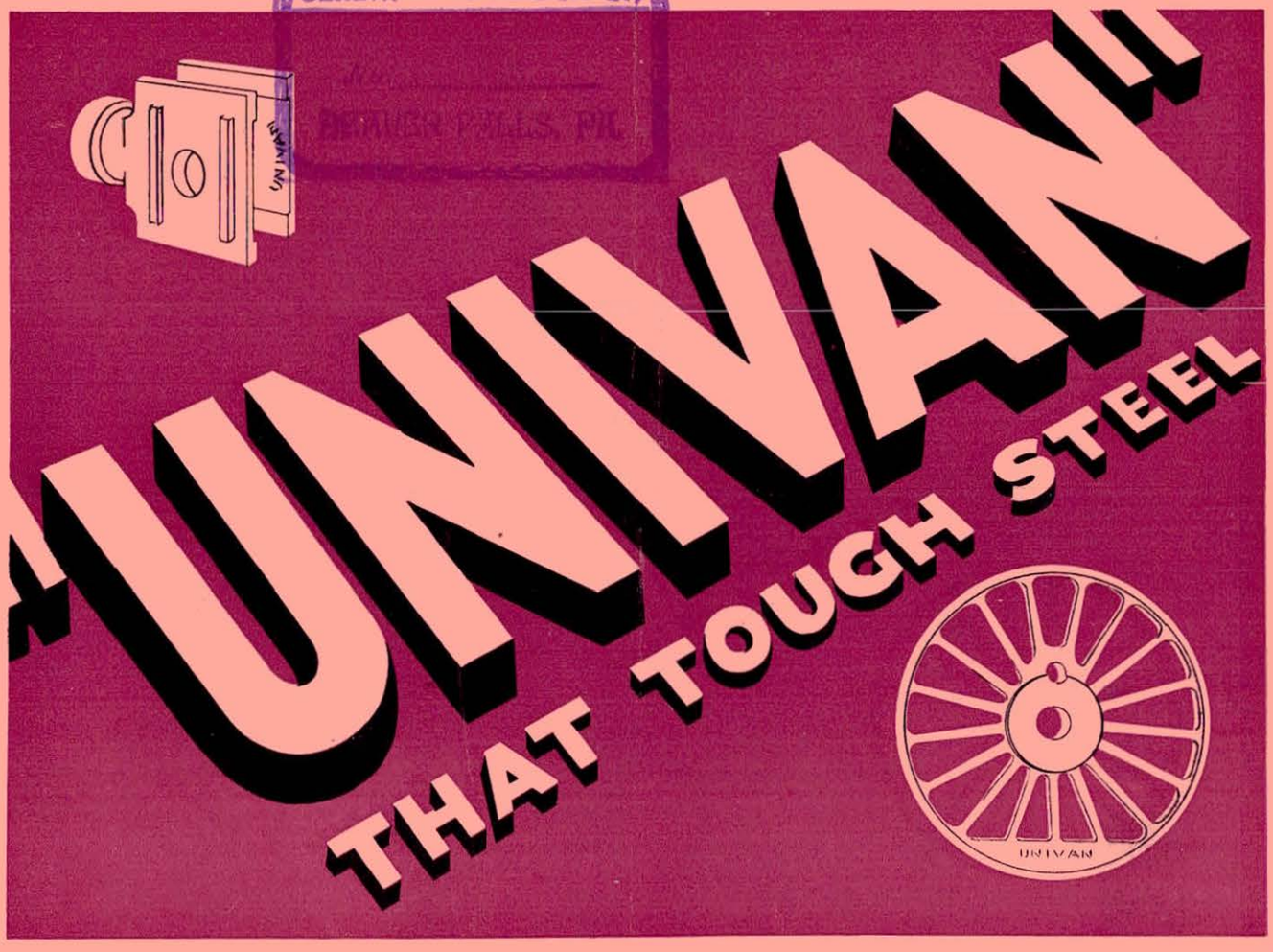

"Build With Steel Castings"

The unusual strength of "UNIVAN" Cast Steel, together with its tough, shock-resisting properties, make it especially suitable for railroad castings which must withstand heavy shocks and severe stresses. The alloys are scientifically blended and the castings are given exact heat treatment to insure uniform structure and physical properties. Specify "UNIVAN" for *that troublesome job.* UNIVAN is particularly adapted for Locomotive Frames, Driving Wheel Centers, Crossheads, Driving Boxes, Eccentric Crank and Crosshead Guides. UNIVAN Steel is a proved product and has been in service for many years with uniform success.

UNION STEEL CASTING COMPANY, PITTSBURGH

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Length by the yard-stick...but *VALUE* by the *YEAR-STICK!*

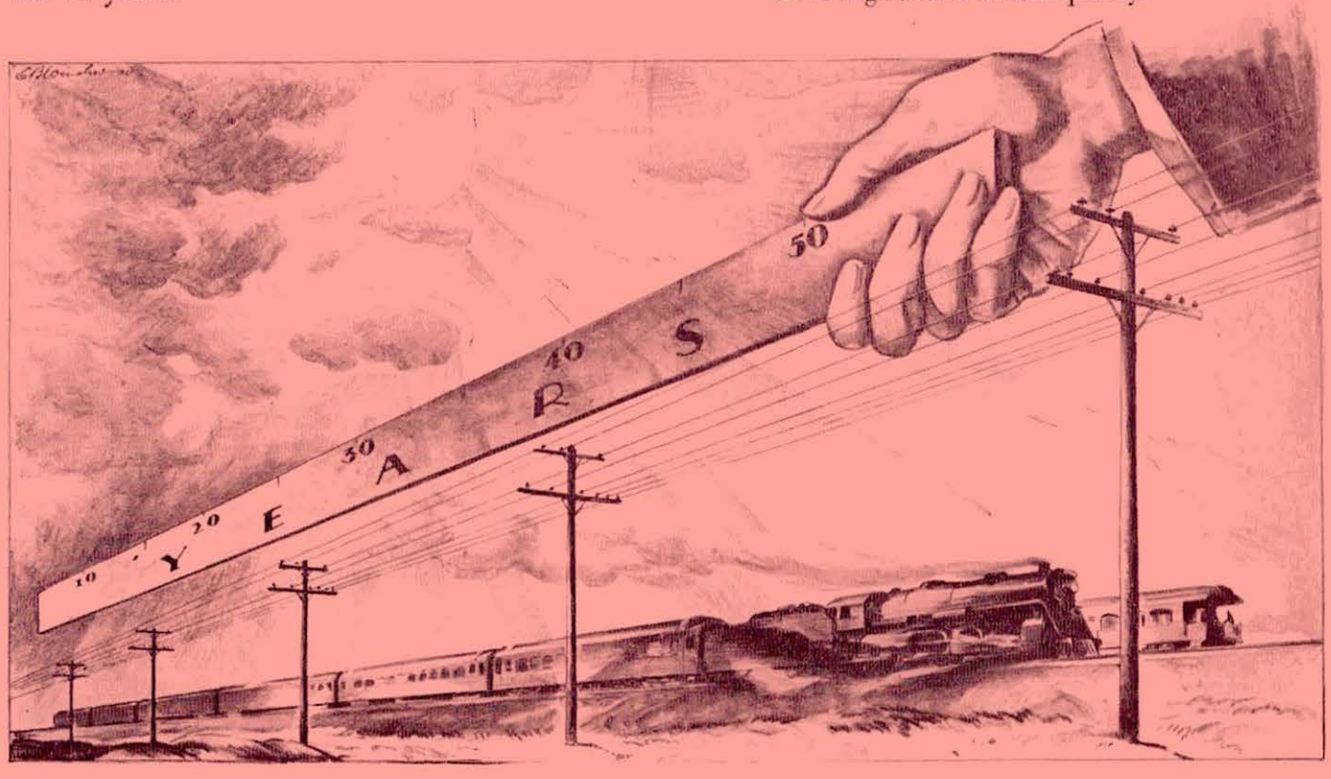
POLES that measure longer in years — such as International Creosoted Yellow Pine Poles — are poles that measure up stronger every year of their life. Protected from decay and made of the strongest of pole woods, International poles offer the greatest resistance to storm damage. Hardware holds firmer, and the poles are safer for linemen to climb.

An interesting feature of Creosoted Pine Poles is their resistance to fire. This feature makes these poles especially valuable for use in grasslands or along railroad lines.

But that's not all. Behind every International pole stands a reputation for quality, integrity, and promptness that has been International's for 50 years.

Prompt Service ...an International pledge...

An important part of the story of International is promptness of service. Because of International's large stock of poles always on hand—plus the availability of International's more than adequate crew of skilled pole framers — this company can be depended upon to make shipments quickly and carefully. And in every pole shipped, one can expect the same high *International* quality.



3CI **International**

CREOSOTING & CONSTRUCTION CO.

PRODUCERS OF CREOSOTED YELLOW PINE POLES

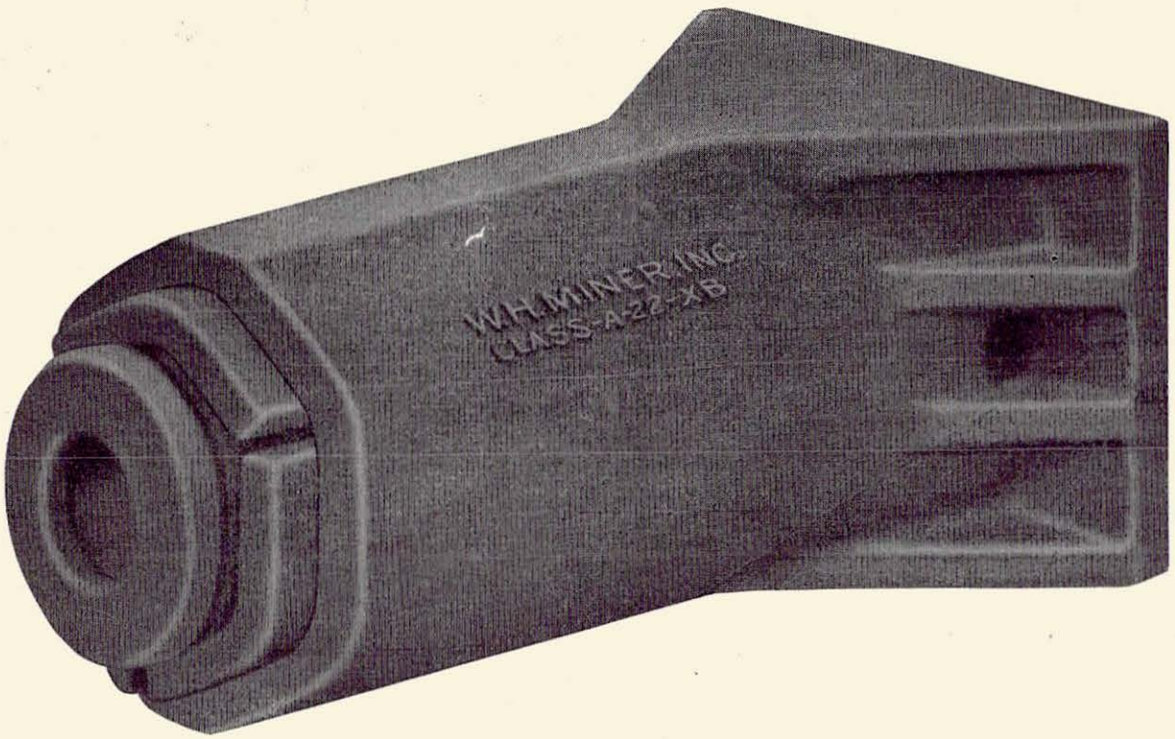
Galveston · Beaumont · Texarkana

DISTRIBUTED BY GRAYBAR

Published weekly by Simmons-Boardman Publishing Company, 34 North Crystal Street, East Stroudsburg, Pa. Entered as second class matter, March 9, 1928, at the Post Office at East Stroudsburg, Pa., under the act of March 3, 1879. Address communications to 30 Church St., New York City.

MINER

Class A-22-XB
Friction Draft Gear

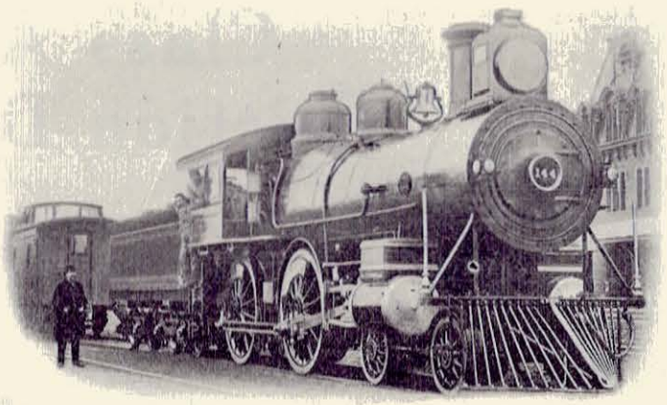


Exceeds the A. R. A. Requirements for Certified Draft Gears

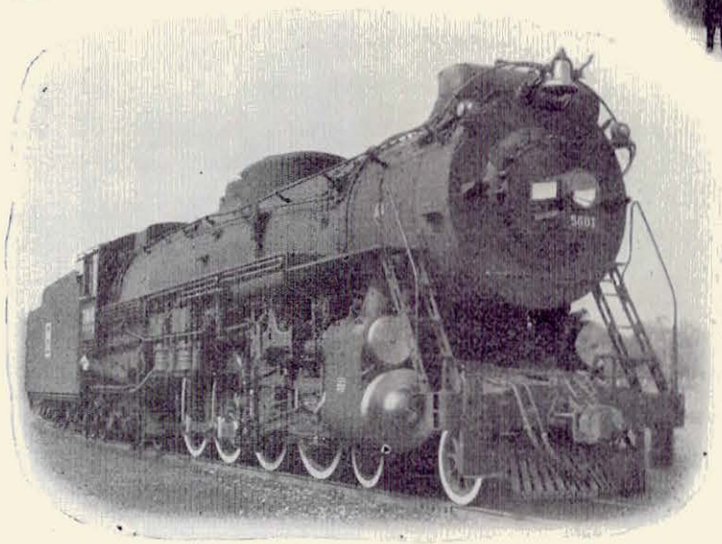
W. H. MINER, INC.
CHICAGO

Only modern locomotives are suited for today's traffic demands

A locomotive like this might be in perfect condition



BUT



in actual operation it would make a poor showing as a revenue-earner when compared with a locomotive like this.

THE progress recently made in motive power design has been so rapid, that no locomotive over ten years old can produce the results shown by strictly modern power—and yet approximately only one-fifth of all the locomotives in service in this country today were built during the past decade.

Here surely is food for reflection. Let us help you solve the problem of modernizing your power.

THE BALDWIN LOCOMOTIVE WORKS 1831 1931

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA

Published every Saturday by the Simmons-Boardman Publishing Company, 34 North Crystal Street, East Stroudsburg, Pa., with executive offices at 30 Church Street, New York

All communications should be addressed to the New York Office, 30 Church Street

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Railway Age

With which are incorporated the Railway Review, the Railroad Gazette and the Railway Age-Gazette. Name Registered U. S. Patent Office.

Vol. 90 February 21, 1931 No. 8

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A New Era for the Railroads ..... Page 396

A competent and detailed analysis of the present railway situation by Horatio L. Whitridge, of the stock exchange firm of J. S. Wilson, Jr. & Co., Baltimore, Md., expressing faith in the integrity, energy and genius of railway officers.

Skids Prove Their Worth 409

Albert West Shaffer, marine assistant, New York Central, tells how that road has reduced its freight handling costs at the Port of New York by 25 per cent, and virtually eliminated damage, through the use of skids moved on power lift trucks.

D. & H. Handles Four Ends of Double Track by Centralized Control 411

How an installation of this type solved operating problems on two short sections of single track between Center Village, N. Y., and Lanesboro, Pa.

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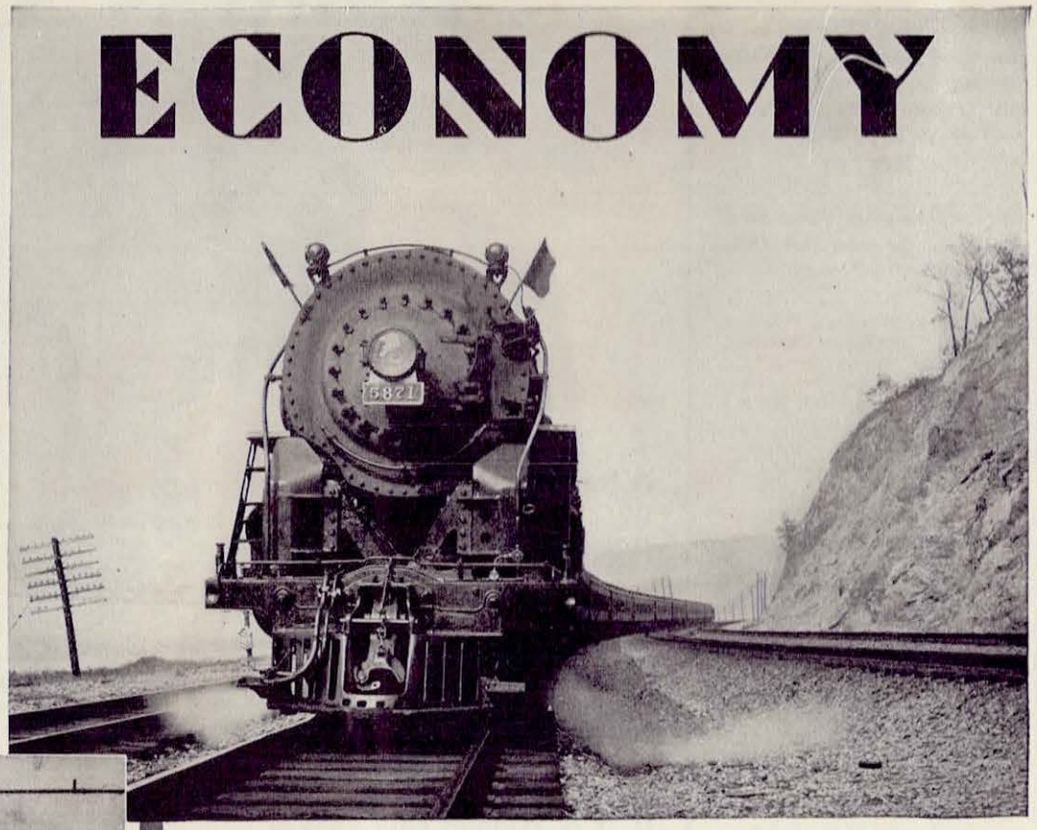
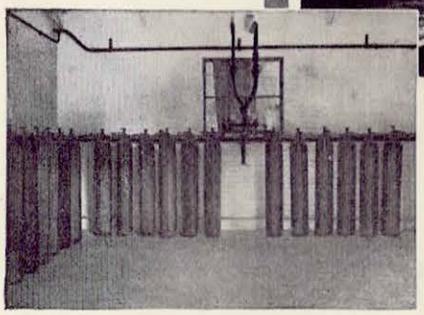
ECONOMY





Oxweld Wall Type Oxygen Manifold installed in Oxweld Standard Generator House

ECONOMICAL generation of acetylene and dependable, waste-proof distribution of oxygen and acetylene for railroad welding and cutting operations are among the salient features of Oxweld Railroad Service. Qualified by years of experience in this work, Oxweld engineers estimate accurately the railroad requirements and furnish and install equipment that has proved most efficient and economical.

Under their supervision, acetylene generators and oxygen manifolds are installed. Oxwelded piping systems are built to insure steady, uninterrupted supplies of gases to points where work is to be done. Handling of gas cylinders is eliminated. No time lost by operator's changing hose and regulators. No interference or delay to other workmen due to cylinders in the way.

Because Oxweld Railroad Service insures maximum economy in oxy-acetylene welding and cutting, the majority of Class I roads contract for it year after year.

OXWELD RAILROAD SERVICE

THE OXWELD RAILROAD SERVICE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

NEW YORK
Carbide and Carbon Bldg.

CHICAGO
Carbide and Carbon Bldg.

WHERE RED SIGNALS SAFETY . . .

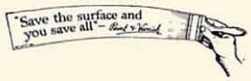
JUST as the coastwise skipper breathes more easily when he "picks up" the oscillations of a charted beacon, so does the maintenance man feel more secure when he sees that his iron and steel structures have their protective coatings of pure red-lead.

For engineers and maintenance men in all fields have learned that pure red-lead defeats the destructive forces that bear the names of weather, corrosion, rust.

Dutch Boy Red-Lead is a fine, uniform, highly oxidized pigment that furnishes an elastic, durable coating that sticks tight—that protects completely—that wears long.

You can buy Dutch Boy Red-Lead in either paste or liquid form. The paste—Red-Lead-in-oil—is easily thinned to brushing consistency. It comes in the natural orange-red and it can be shaded to darker colors. Dutch Boy Liquid Red-Lead is supplied in six colors—orange-red, two shades each of green and brown...and black.

We invite you to consult our Department of Technical Paint Service about your metal painting problems. Also, ask our nearest branch for helpful booklet—"Structural Metal Painting".



DUTCH BOY RED-LEAD

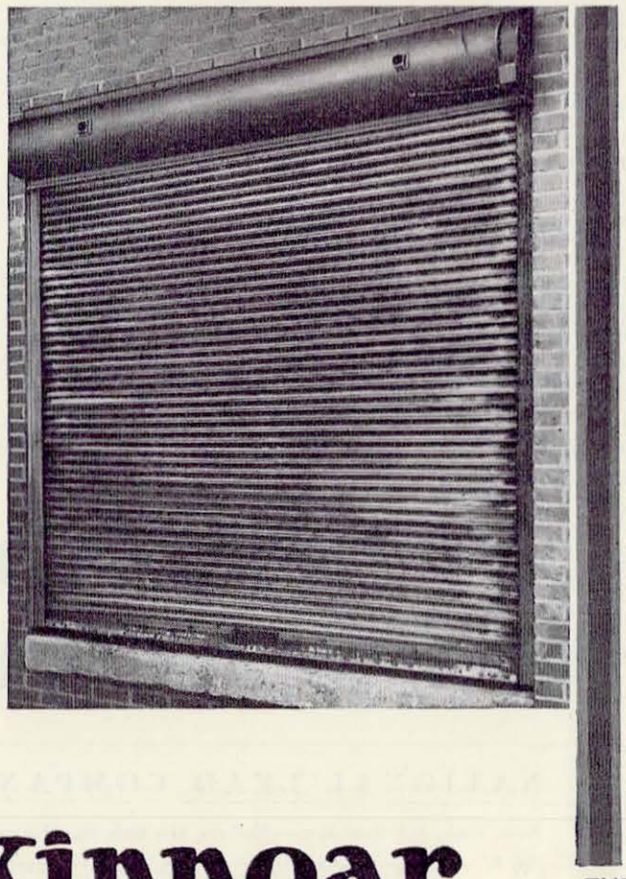
NATIONAL LEAD COMPANY

New York, 111 Broadway—Buffalo, 116 Oak St.—Chicago, 900 W. 18th St.—Cincinnati, 659 Freeman Ave.—Cleveland, 820 West Superior Ave.—St. Louis, 722 Chestnut Street—San Francisco, 2240 24th Street—Boston, National-Boston Lead Company, 800 Albany Street—Pittsburgh, National Lead & Oil Company of Pa., 316 Fourth Avenue—Philadelphia, John T. Lewis & Bros. Co., Widener Building.

28 years ago
installed in an
Oklahoma Garage

18 years later
sold by owners—*at more than its original cost—and installed* in a furniture warehouse

today "working first class"
(see letter below)



Unusual?

Unusual? . . . Yes — but it is this delivering dependable, satisfactory service, day-in and day-out for years and years and years that has established for KINNEAR Steel Rolling Doors the pre-eminent position they occupy in the rolling door field today. Why be satisfied with anything less than the best—especially when, service considered, KINNEAR Steel Rolling Doors actually cost less? Write for your copy of the illustrated Kinnear catalog and details of Kinnear Engineering and Estimating Service available without cost or obligation.

GROSS CONSTRUCTION COMPANY
GALVESTON WACO OKLAHOMA

Oklahoma City, Okla.
Oct. 27, 1920

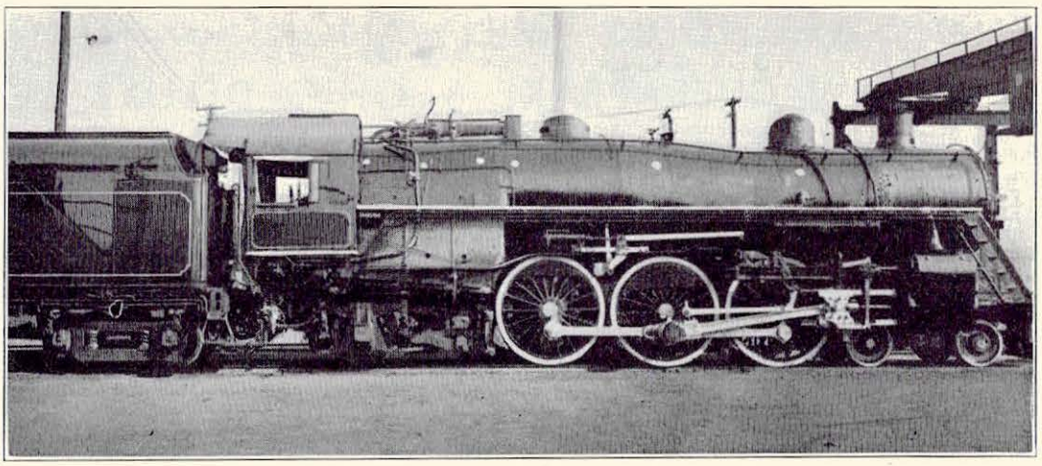
Eighteen years ago I bought a door from you for my garage. I have used the door ever since. Last week we finished a warehouse for a large furniture concern here. They wanted a rolling door quick. We took our garage door off and sold it to them for more money than the door cost me eighteen years ago. Of course the price was lower then. They are very much pleased with the door - it is working first class.

GROSS CONSTRUCTION CO.
By F. A. Gross

Note that this letter is dated Oct. 27, 1920. This same door - after 28 years - just as Mr. Gross said 10 years ago - "is still working first class."

kinnear
ROLLING DOORS

THE KINNEAR MANUFACTURING CO.
876-900 Field Ave., Columbus, Ohio, U. S. A.
Boston Chicago Cincinnati Cleveland
Detroit New Orleans New York Philadelphia
Pittsburgh Kansas City San Francisco



PROTECT and SMARTEN YOUR LOCOMOTIVES with Armco Jacket Sheets

ARMCO
RAILROAD PRODUCTS

Wrought Steel Wheels
•
Car Siding
•
Locomotive Jacket Sheets
•
Passenger Car Sheets and Plates
•
Freight Car Sheets and Plates
•
Galvanized Ingot Iron and Steel Sheets
•
Blue Annealed Ingot Iron and Steel Sheets

LOCOMOTIVES covered with Armco Jacket Sheets are as sleek and lustrous as well-groomed colts. They are smooth and easily cleaned, too; and lighten the task of wiping and polishing between runs.

Soft and ductile, Armco Jacket Sheets form quickly and surely, thus reducing shop costs and assuring a finely finished job.

As for durability, Armco locomotive jackets have an enviable record. Many thrifty railroad buyers have adopted them as standard jacket material because of their proved rust-resistance and ability to last through more shoppings than ordinary sheets.

There is a suitable grade, size and finish in stock for your every requirement, whether it be for yard, freight, or crack passenger locomotives. An Armco Engineer is ready to help you select the sheet most appropriate for your purpose. Call him in—from the nearest office.

ARMCO RAILROAD SALES CO.
Executive Offices: Middletown, Ohio

DISTRICT OFFICES: New York . Chicago . Philadelphia . Cleveland . St. Louis

ARMCO

SPECIALLY PROCESSED
ARMCO IRON AND STEEL SHEETS
FOR EXACTING PURPOSES

NO PASSENGERS WILL ALIGHT *travel weary* FROM NEW CHESAPEAKE & OHIO DELUXE COACHES

equipped with

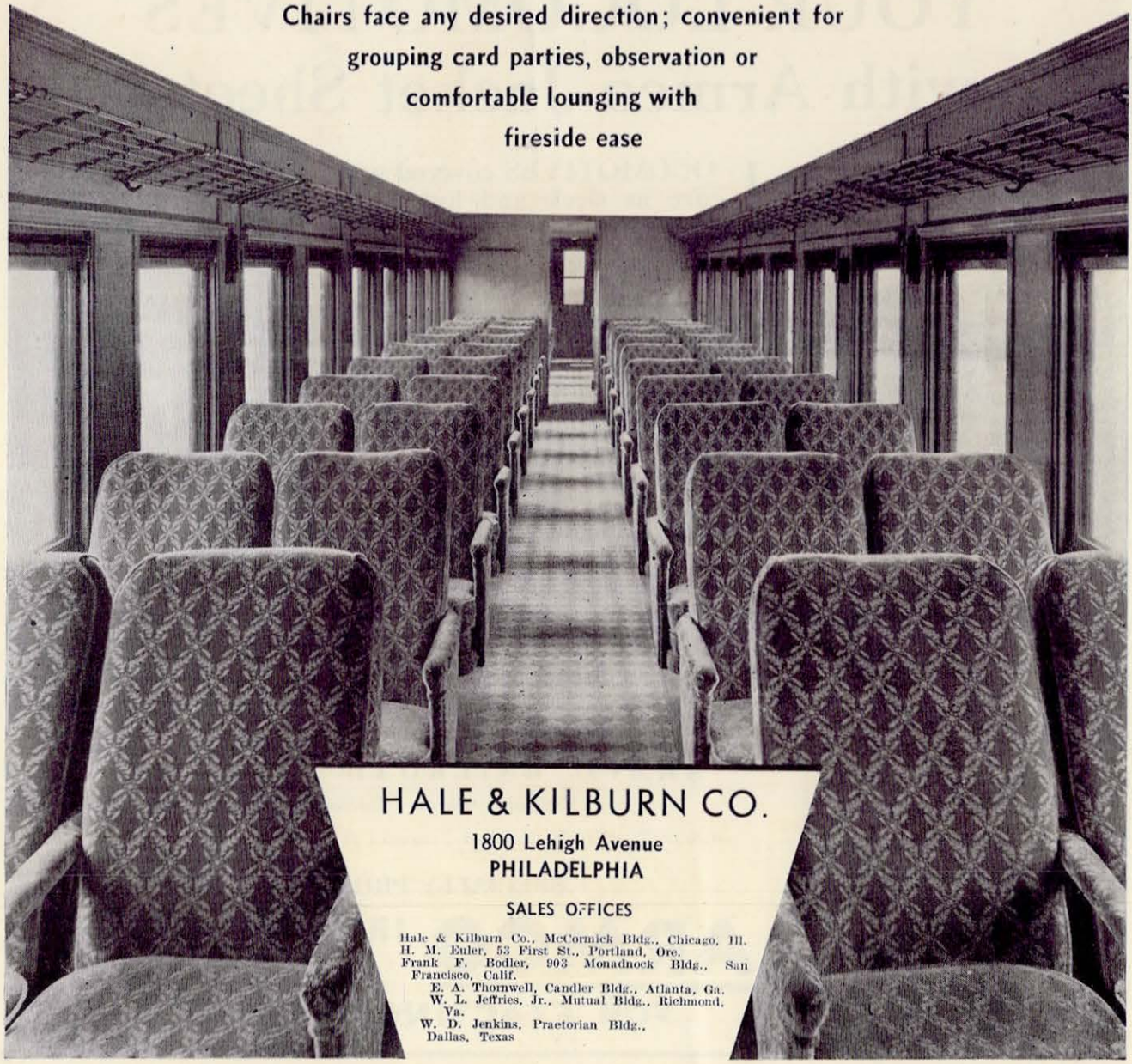
HALE & KILBURN

No. 930 DOUBLE ROTATING CHAIRS

Individual air spring top pads
Comfortable cushioned arms
Folding aluminum footrests
Super soft well pitched backs
Center collapsible armrest
Stabilized rotating base

Self lubricating mechanism

Chairs face any desired direction; convenient for grouping card parties, observation or comfortable lounging with fireside ease



HALE & KILBURN CO.
1800 Lehigh Avenue
PHILADELPHIA

SALES OFFICES

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H. M. Euler, 53 First St., Portland, Ore.
Frank F. Bodler, 903 Monadnock Bldg., San Francisco, Calif.
E. A. Thornwell, Candler Bldg., Atlanta, Ga.
W. L. Jeffries, Jr., Mutual Bldg., Richmond, Va.
W. D. Jenkins, Praetorian Bldg., Dallas, Texas

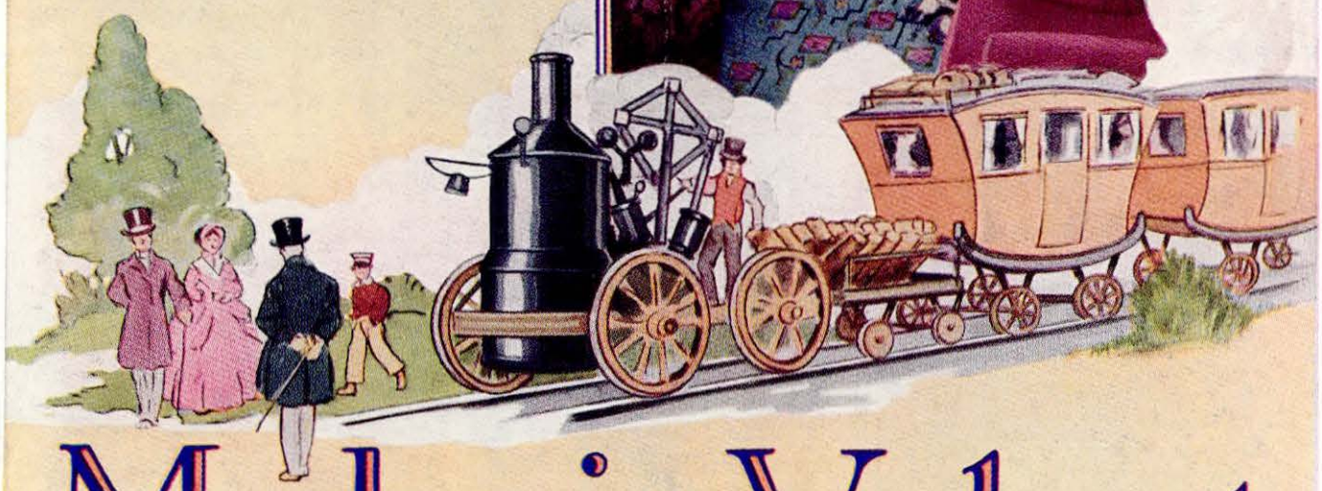
Aboard a Union Pacific De-luxe lounge car, in which home luxury is emphasized by the use of chair upholstery of Chase VELMO.

It's a long way from "Puffing Billy" and converted mail coaches to the luxury and comfort of today's railroad travel.

And in marked contrast to the plainer Chase Mohairs used over fifty years ago on railroads, are the newest Chase VELMO velvets in beautiful modern patterns which are the choice of railroads vieing with each other to excel in that which is most attractive to a public appreciative of style and luxury.

But in all these years one thing has not changed. Chase Mohair always has been, and still is enduringly smart, profitably practical, and the outstanding leader of all travel fabrics.

Selling Agents: L. C. Chase & Company • Boston
New York · Chicago · Detroit · San Francisco



Mohair Velvet

CHASE Velmo
UPHOLSTERY FABRICS

Made by
SANFORD MILLS -- SANFORD, MAINE

Consultant On Upholstery Problems At Your Service

The spirit of decoration and utility has been obtained through the medium of Chase plushes better than with any other fabric. And to assist further, we now offer you the services of an experienced and recognized stylist who would be glad to suggest or co-operate in shaping up your original ideas . . . if you desire.

Write for
Samples and
Further Details

Here shown are only a few of the many smart Velmo patterns created for railway coach work.

CHASE
Velmo
UPHOLSTERY
FABRICS

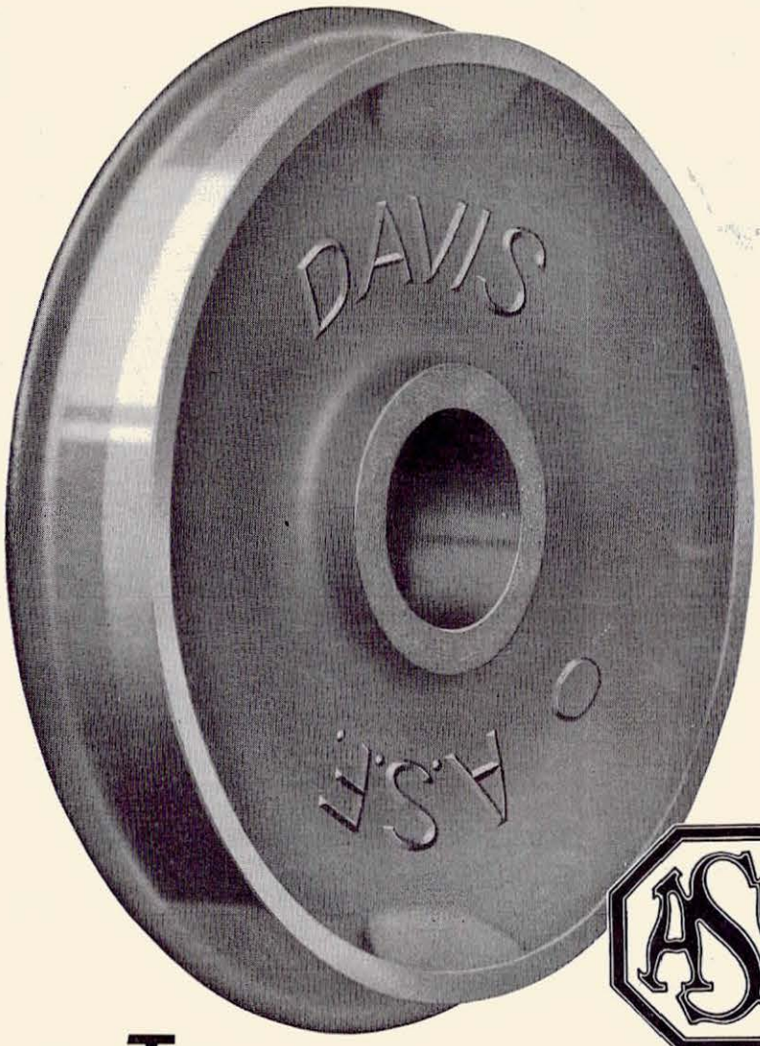
Besides offering a variety of figured effects . . there are the standard, solid colors in a wide range.

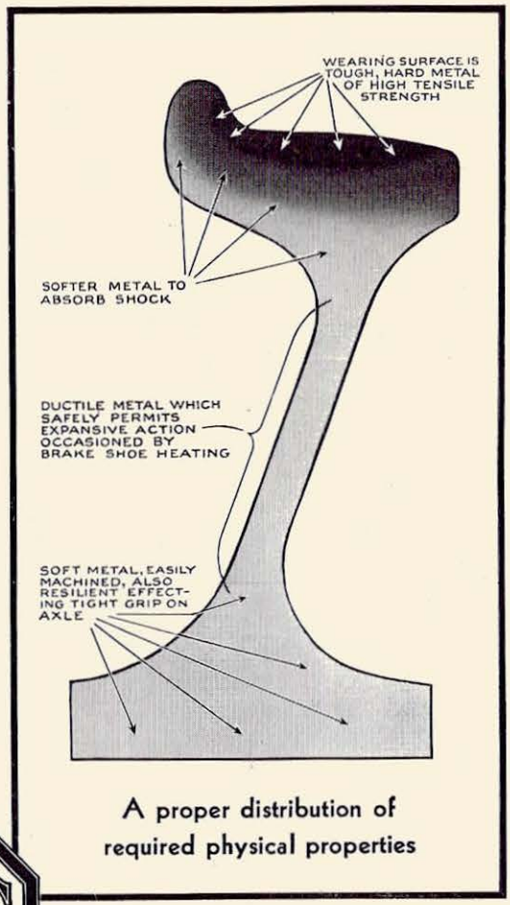
The atmosphere of comfort and beauty which is characteristic of the American home, is now being expressed in railway coaches through upholstery of Chase VELMO. It is to these regal pile "mohairs" that designers turn when the problem of *practical luxury* is to be solved . . . plushes of enduring charm . . . high-styled and decorative . . . or in blending neutral tone-effects for use where simplicity is paramount.

SANFORD MILLS, SANFORD, MAINE
Selling Agents: L. C. Chase & Co., Boston, New York, San Francisco, Atlantic City, Chicago Detroit

Adding A New Decorative Charm And Luxury To Travel

Meeting Conflicting Requirements




WEARING SURFACE IS TOUGH, HARD METAL OF HIGH TENSILE STRENGTH
SOFTER METAL TO ABSORB SHOCK
DUCTILE METAL WHICH SAFELY PERMITS EXPANSIVE ACTION OCCASIONED BY BRAKE SHOE HEATING
SOFT METAL, EASILY MACHINED, ALSO RESILIENT EFFECTING TIGHT GRIP ON AXLE

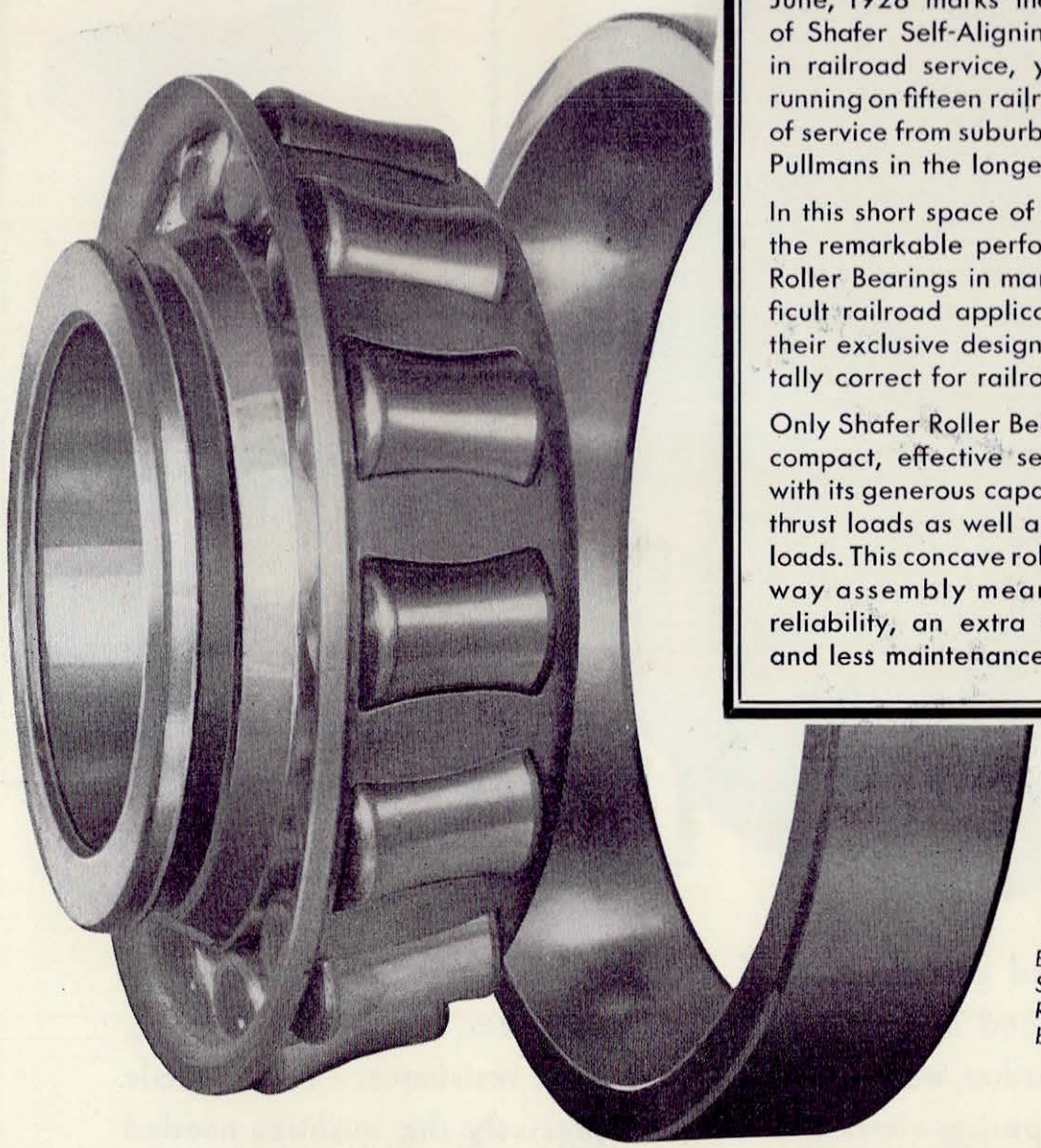
A proper distribution of required physical properties

THE tread and the hub of a wheel won't agree as to what constitutes good material. One wants hardness and wear resistance, and the other wants ductility and shock resistance. To reconcile these opposing views and develop precisely the qualities needed in each part is the purpose of the special heat-treated composition of the Davis "One-Wear" Steel Wheel. Only such a special material can develop the unusual characteristics that make a steel wheel truly "One-Wear."

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

Recognized Leadership IN LESS THAN THREE YEARS!



June, 1928 marks the first installation of Shafer Self-Aligning Roller Bearings in railroad service, yet now they are running on fifteen railroads, in all classes of service from suburban cars to through Pullmans in the longest runs.

In this short space of less than 3 years the remarkable performance of Shafer Roller Bearings in many of the most difficult railroad applications has proved their exclusive design to be fundamentally correct for railroad service.

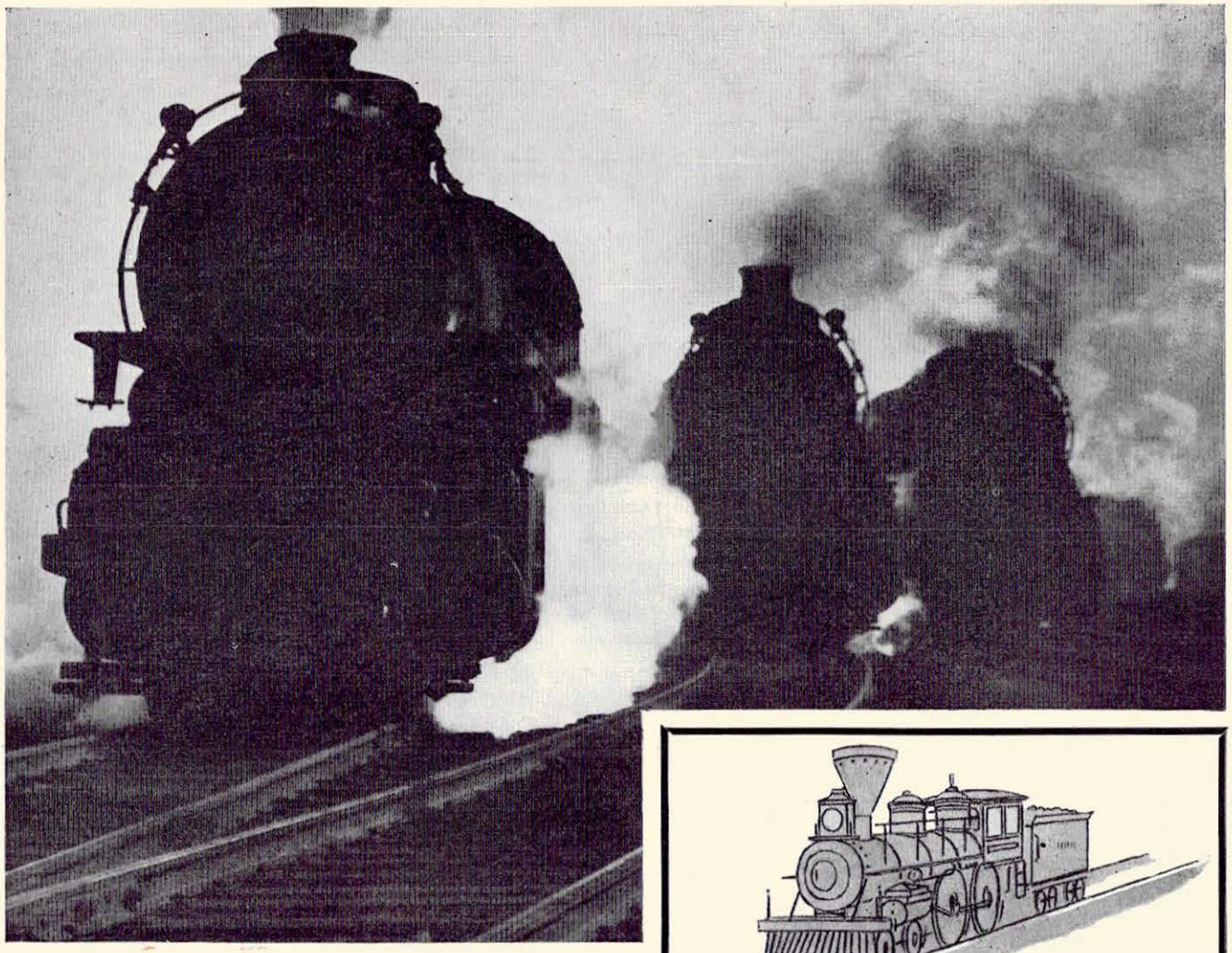
Only Shafer Roller Bearings provide the compact, effective self-aligning design with its generous capacity for shock and thrust loads as well as for heavy radial loads. This concave roller—convex raceway assembly means definite extra reliability, an extra margin of safety, and less maintenance attention.

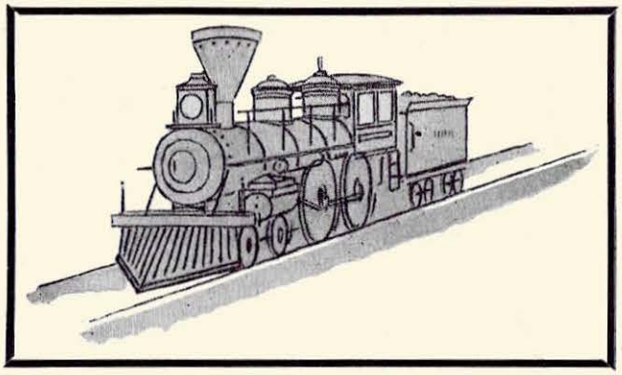
Bulletins describing Shafer Self-Aligning Roller Bearings will be sent on request.

SHAFER
SELF-ALIGNING
ROLLER BEARINGS

SHAFER BEARING CORPORATION, 6501-99 West Grand Avenue, Chicago, Illinois

RA2-21Gray





Just as "Standard"
Materials keep on giving economical, trouble-free service through the years, so do we keep everlastingly at it — in research, designing and developing to make "Standard" Steel parts even better.

STANDARD STEEL WORKS COMPANY

GENERAL OFFICES & WORKS: BURNHAM, PA.

NEW YORK
CHICAGO
PHILADELPHIA

ST. LOUIS
RICHMOND

AKRON
PORTLAND
SAN FRANCISCO

The ONLY

Railway Journal Bearing with a Record of 980,000 Miles on a Single Passenger Coach

NINE years of service! Over 980,000 miles! Under Pennsylvania coach 4925, veteran SKF bearings have served faithfully year in and year out; in all kinds of weather, causing no delays, asking no attention. Here is a record unapproached by any other bearing.

Continuity of service and low rolling friction are the inducements for applying anti-friction bearings.

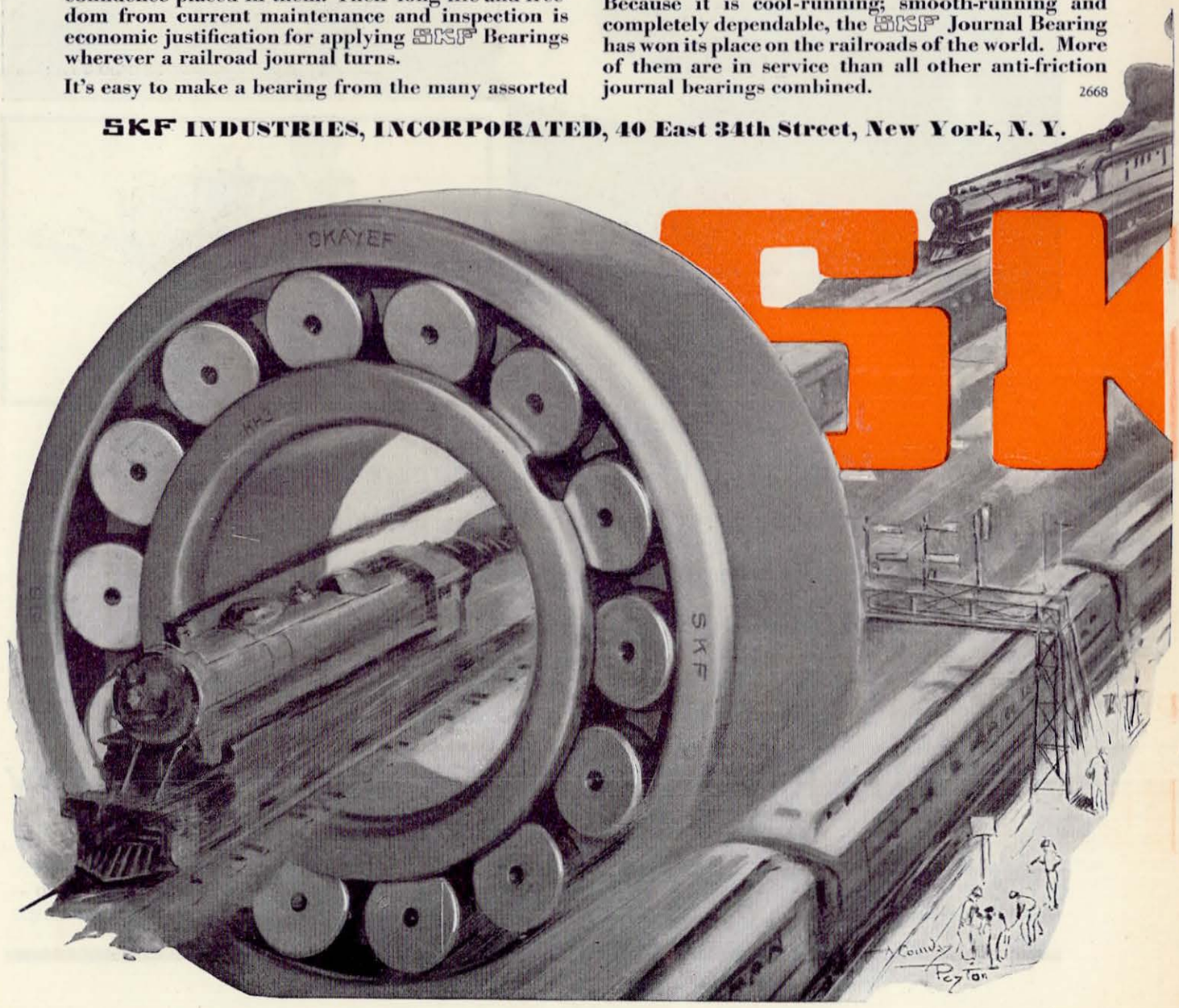
On both counts, SKF bearings have fully repaid the confidence placed in them. Their long life and freedom from current maintenance and inspection is economic justification for applying SKF Bearings wherever a railroad journal turns.

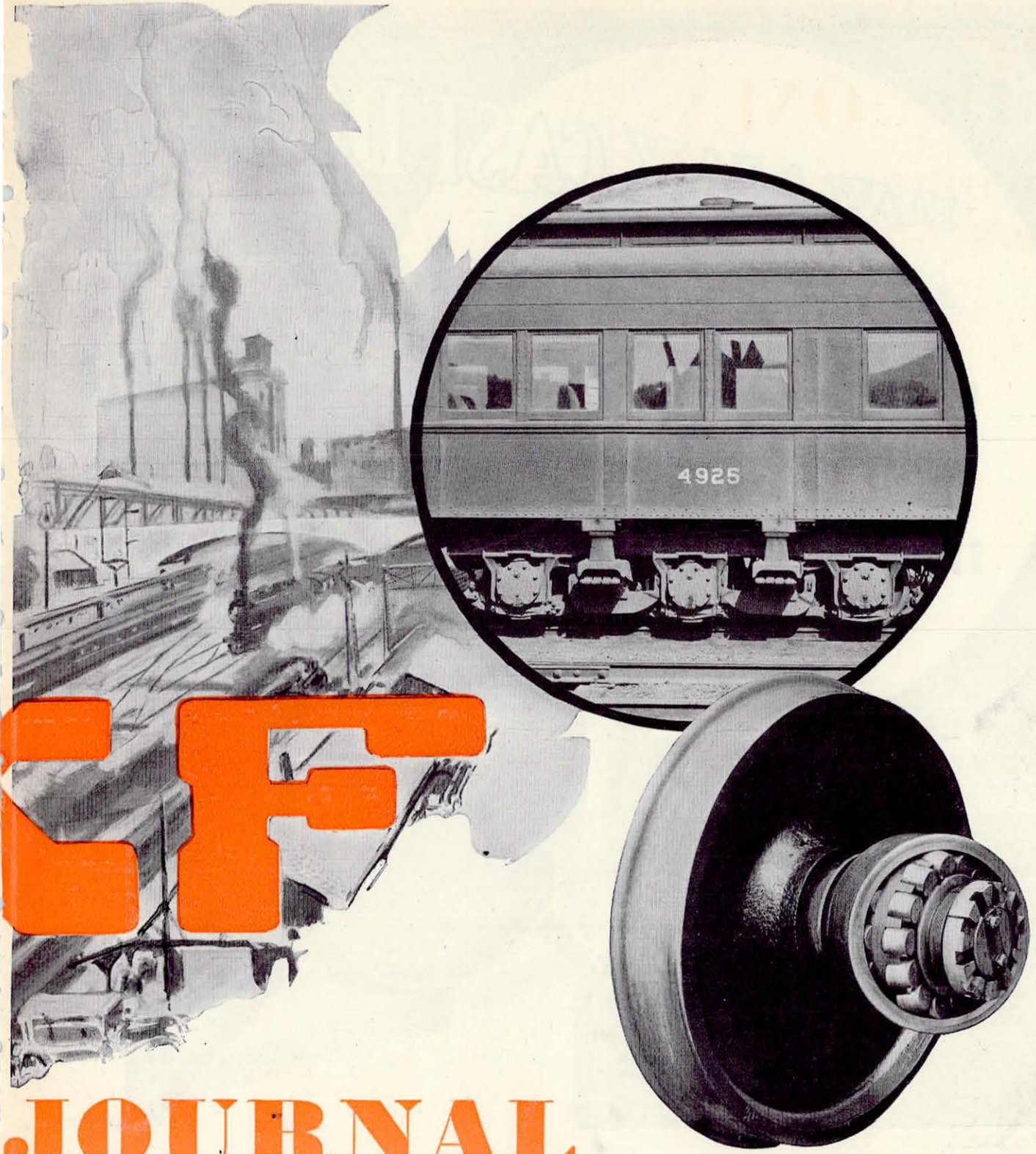
It's easy to make a bearing from the many assorted kinds of rolling elements. But it's another matter to make an anti-friction bearing that will consistently develop hundreds of thousands of miles; whose only maintenance between shoppings is checking of the oil level; a bearing that will take the shock and thrust of railroad service without need for adjustment.

SKF has behind it the years of performance that qualify it as a sound railroad bearing.

Because it is cool-running; smooth-running and completely dependable, the SKF Journal Bearing has won its place on the railroads of the world. More of them are in service than all other anti-friction journal bearings combined. 2668

SKF INDUSTRIES, INCORPORATED, 40 East 34th Street, New York, N. Y.



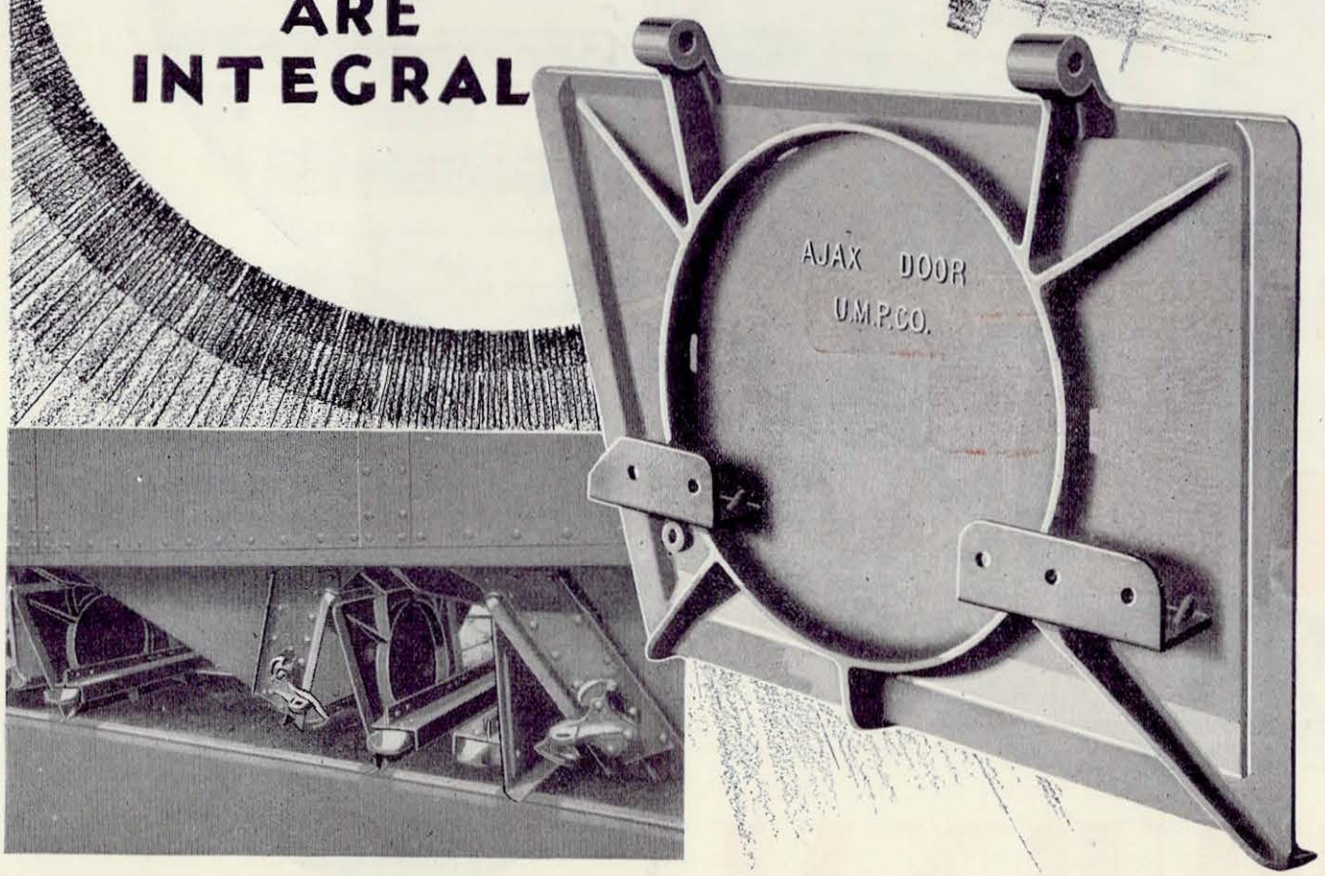


JOURNAL BEARINGS

This is an unretouched photograph of the SKF bearing used under Pennsylvania car 4925 as exhibited at the A. R. A. Convention at Atlantic City, 1930. Neither bearing on the axle had been adjusted nor any parts replaced. After 980,000 miles of service the bearing showed no appreciable wear and was returned to regular service during July, 1930.

NEW AJAX CAST DOORS ARE ONE PIECE DOORS

HINGE LUGS AND REINFORCEMENTS ARE INTEGRAL



UNION METAL PRODUCTS COMPANY

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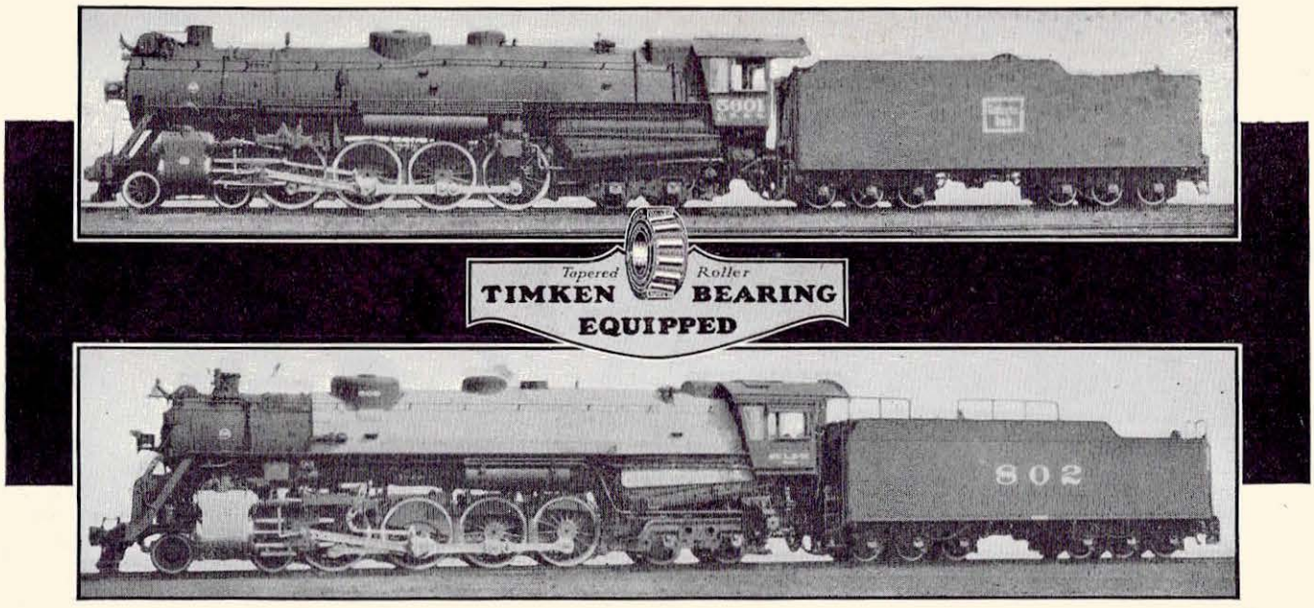


Two More Railroads Use Timken Bearing Equipped Engine Trucks

The use of Timken Bearing equipped engine trucks is spreading rapidly as one railroad after another proves their advantages. Two of the latest roads to use them are The Chicago, Burlington and Quincy (Burlington Route) which has 21 in service, and The St. Louis Southwestern (Cotton Belt Route) operating 5.

Timken-equipped engine trucks promote increased reliability of locomotive service by eliminating hot boxes, hot hubs and heat checks on wheel hubs.

They cut maintenance costs to the bone by (1) permitting the use of standard A.R.A. tender wheels instead of special thrust-hub wheels, thrust loads as well as radial loads being carried by the tapered rolling surfaces of the bearings; (2) reducing inspection to the checking of the oil level once every 30 days; (3) eliminating wear on axles, wheel hubs and housings by confining motion to the bearings themselves; (4) enabling wheels to be turned without taking the axle assembly apart; (5) extending the period of uninterrupted service to the regular shopping period of the locomotive.

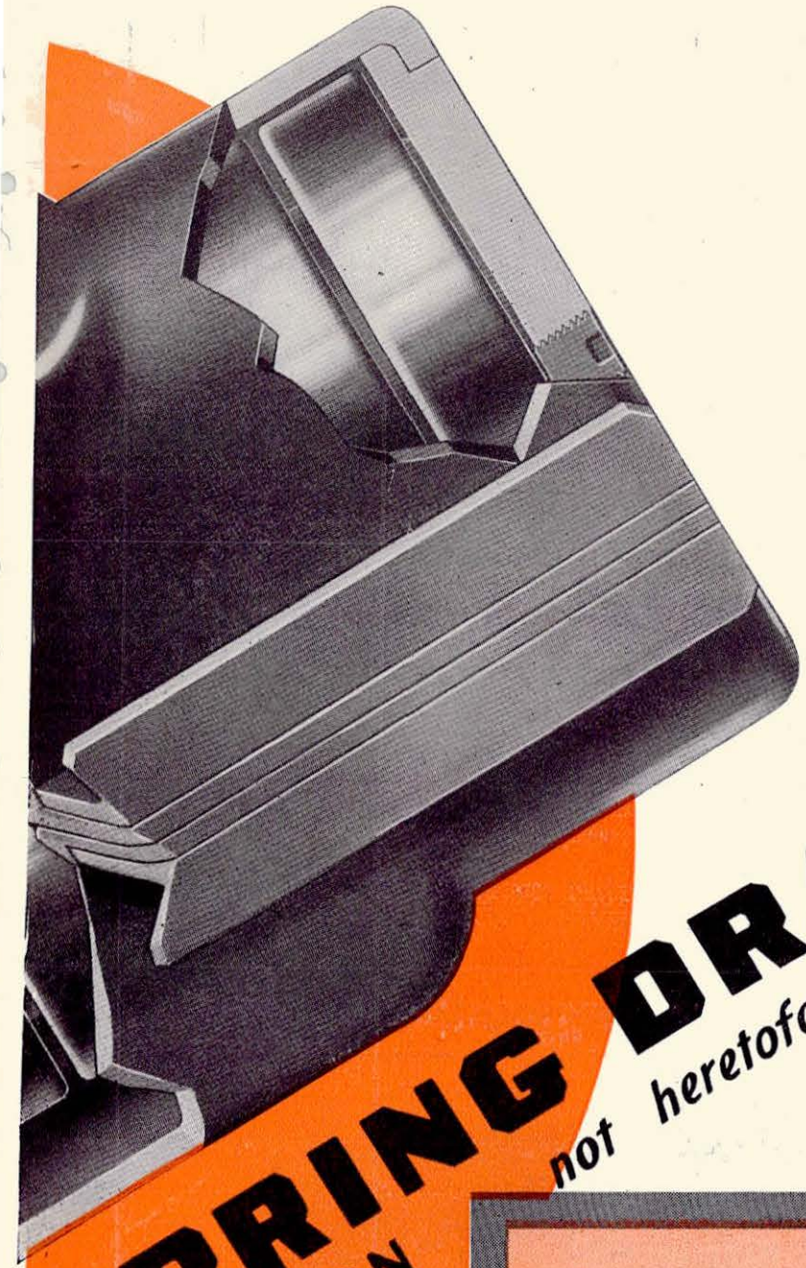
These results were not secured by merely adapting Timken Bearings to plain bearing trucks, but through a complete new axle design originated by Timken engineers. Write for full information and prints. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**

PROTECTION— AT LOW COST

EDGEWATER

RING « Equipment



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PROTECTION

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steel rings *made it possible*

Repeated tests have demonstrated the unequalled uniformity of action—the high capacity and endurance ratings of the Edgewater Ring Spring Draft Gear—the lubricated rolled alloy steel rings—the rugged, sturdy, construction—and master workmanship—all combine to give to this better draft gear the ability to withstand the most severe service tests.

EDGEWATER STEEL COMPANY, *Pittsburgh, Pa.*

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Getting Down to Brass Tacks *About The* ROOF Question

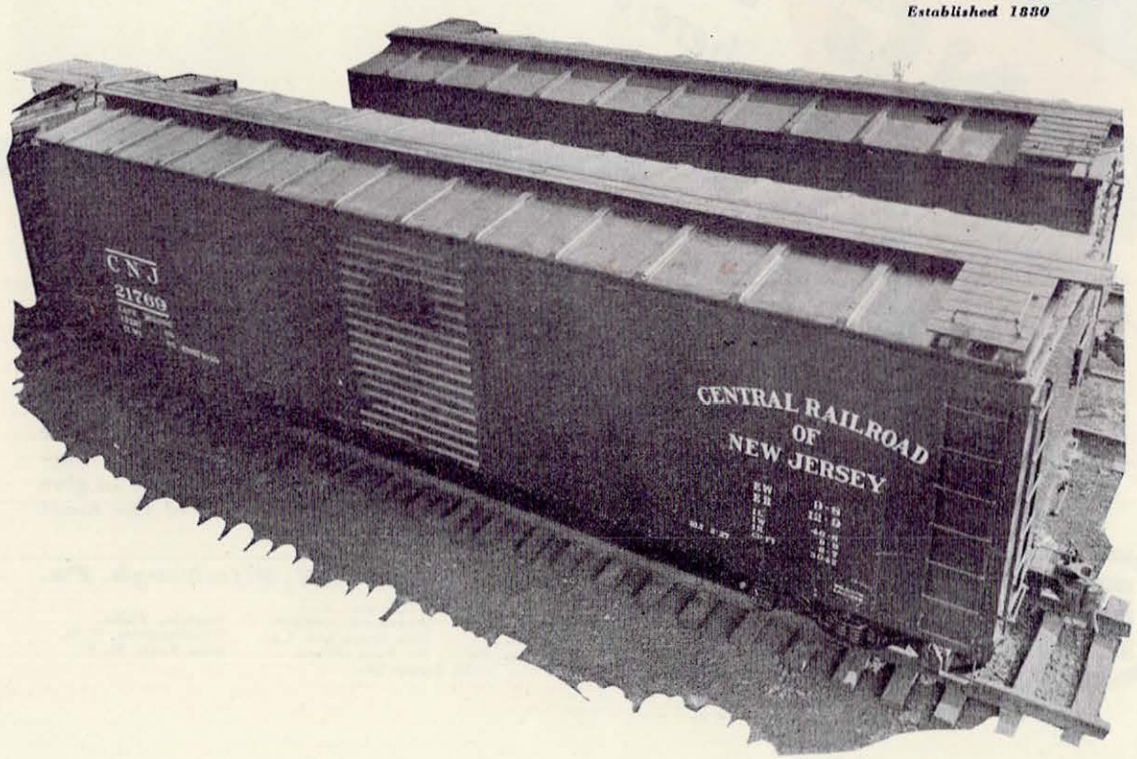
The cost of keeping cars adequately roofed is a maintenance item which looms large on many roads. Little leaks in roofs mean big leaks—spoiled lading, revenue earning cars tied up, high repair bills—in the railroad treasury. What you have to do to keep a roof weatherproof may be lavish expenditure or it may be rigid economy, depending upon the roof you select.

Rigid Economy Demands
UNIVERSAL DRY LADING ROOFS

Think what it means to be able to stock only one size of roof parts, so adjustable that singly or in combination they can be applied to any car, and the job can be done in the nearest repair yard—no dead-heading home if on a foreign line, or hauling to a main shop if on the home line. These units are not part of the car superstructure, subject to body stresses. Universal Dry Lading Roofs allow free ventilation so that sweating is reduced to a minimum in cars loaded with commodities that give off moisture.

Can you afford to pass up this opportunity to pare operating costs?

HUTCHINS CAR ROOFING COMPANY
DETROIT MICHIGAN
Established 1880



RAILWAY AGE

The Responsibility of the Commission

The present most unsatisfactory condition and prospects of the railroad industry are due to several causes. These include excessive competition between the railways themselves, subsidized and virtually unregulated competition by other means of transportation, and, of course, the business depression. All of these have been discussed and their effects pointed out in the *Railway Age*.

But the principal responsibility rests upon those former and present members of the Interstate Commerce Commission who have determined its policy of regulation during the last ten years. When Congress passed the Transportation act it gave instructions regarding the regulation of railway rates and earnings which, if the commission had carried them out, would have enabled the railways to secure a larger net return when general business was good, and would have prevented their return from declining to such a low and dangerous level as it has during the present economic depression.

Numerous newspapers in all parts of the country have published editorials saying that recent expressions of the commission indicate an intention to be more liberal with the railways in future, and commending its assumed change of attitude. The *Railway Age* wishes it could see some evidence of a change in the commission's attitude, but is unable to do so. The commission has recommended repeal of the recapture provisions. This, however, would be of doubtful benefit to the railways. Under the decision of the Supreme court in the O'Fallon case recapture must be based upon constitutional valuations, and the repeal of the recapture provisions would deprive individual railways of the best means they now have for testing in the courts whether the valuations made by the commission are constitutional. Apparently the real motive of the commission in advocating abolition of recapture is to make impracticable such litigation by individual railways, and thereby avoid the constitutional valuations that in consequence it would have to make.

The commission's recommendation of legislation to substitute "rate bases" for valuations in the regulation of rates is plainly intended to get statutory instructions from Congress for restricting the railways to a much smaller net return than the constitutional "fair return upon a fair valuation." The commission, in its letter of January 21 to Senator Couzens, admitted that the railways have constantly failed since the Transportation act was passed to earn the fair return which that act assures them, but, at the same time, defended the policy followed by it which has had this result. This does not encourage the belief that it intends, if the legislation proposed by it is passed, to adopt a more liberal policy in future. What it seems to be seeking is legislative authority to do in future what it has done without legislative authority throughout the last decade.

The Commission's Future Policy

This raises a question of vast importance. What will the attitude and policy of the commission be in future? There are various departments and branches of the federal and state governments that devote themselves to promoting the prosperity of other industries and classes of the people. The Interstate Commerce Commission is the only federal government agency expressly charged with the duty of dealing with problems that involve the future earning capacity of the railroad industry and its ability to give employment. The commission already has power enough greatly to harm or help that industry, and it is asking for more power. It has almost equal power, although not expressly given it by law, to harm or help other great industries. The railway equipment and supply manufacturing industry is a very large one, and the policy followed by the commission determines its prosperity or adversity as surely as that of the railways. Furthermore, the commission's policy in very large measure determines the number of persons the railways and the manufacturers of railway equipment and supplies can employ and the wages they can pay. Finally, the commission's policy, by determin-

ing the earnings the railways can make, regulates the kind of service they can render and thereby indirectly affects the prosperity of every other industry.

It follows that the commission's attitude and policy will, in future, as they have in the past, mainly determine the actual value of many billions of invested capital, and the amount of employment available for and the wages that can be paid to millions of men.

The nation is trying to struggle out of the depths of a profound and prolonged depression. The railroads, and the industries and men dependent upon them for business and employment, represent so very large a part of the invested capital and population of the country that upon the way they are directly and indirectly treated will largely depend how soon prosperity will be restored, the degree of it that will be attained, and how long it will last. Probably the eleven men composing the commission have more actual power to influence the nation's future prosperity than any other eleven men in public or private life.

The commission must know the present situation of the railways. It must realize the enormous difficulties presented to them by a rapidly declining passenger business, a decline in the growth of their freight business, the increasing competition of government-aided means of transportation, and the constant demands for such reductions of rates as it ordered in the grain rate case. Surely experience during the present depression should warn it of the danger of restricting railway earnings during years of good general business as it did from the time it made the general reduction in rates in 1922 until the collapse of business late in 1929.

Commission Has Enough Power

Under existing law the commission is expressly directed to use its power to help the railways make adequate earnings. It is not warranted by existing law in pursuing a positive policy of reducing rates, and then immediately adopting a negative policy of passing over to railway managers the entire responsibility of initiating the other changes in rates needed to provide adequate earnings. The commission can give Congress and the public the facts as to the kind of competition to which the railways are now subjected, as to the governmental policies which make it possible, and as to the policies that ought to be adopted to give the railways fair play. It can authorize readjustments of rates which will enable the railways to compete with water carriers to the Pacific coast. It can indefinitely postpone the reduction of grain rates unwisely ordered by it. The commission, in fairness to the railways and with due regard to the public interest, could adopt a constructive policy which, if it were allowed to carry it out, would cause a most beneficent revolution in the transportation situation in the United States.

Would it be allowed to carry it out? The commission is under constant pressure from radical public men to ruin the railways. In attempting to carry out a broad and constructive policy it would meet with much opposition from them and from some powerful business interests, and it would have to exercise courage as well as ability. It would need the strongest possible backing from all those who want to see the railways given fair play and the nation's transportation problem solved in accordance with sound economic principles.

There have been numerous changes in the commission's personnel within recent years. Its members who retired during these years included some men who favored destructive and some constructive policies. Its present majority of six members who have served four years or less can determine its policy for some time in future. Upon the entire membership of the commission, and especially upon these newer members, rests a tremendous responsibility. They can evade that responsibility without the public knowing in what measure each of them should be blamed. If they assume and courageously bear it, they will not escape criticism, and may be cashiered by a senate many of whose members seem to believe that the prosperity of the country can best be promoted by bankrupting one or more of its greatest industries. Never, however, was there such need as there is now for members of the commission who would rather be right than interstate commerce commissioners.

As this paper has said once before: "Changes in existing federal laws for the regulation of railways may hasten the disaster toward which the railways seem to be drifting, but cannot prevent it. The principal thing needed to prevent it is the adoption by the Interstate Commerce Commission of a constructive policy that will help the railways to recover their earning capacity." The utmost exercise of energy and skill by railway managers will be required; but all their efforts will not solve the present railroad problem unless they are supplemented by a more positive and constructive policy than the Interstate Commerce Commission has ever followed during the twenty-five years that it has had the power of effective regulation.

Some Facts About Motor Vehicle Taxes

Great efforts are being made by operators of motor buses and trucks to convince the public that they are paying as much as they should for the use of the highways, and therefore are not being subsidized at the public expense in competing with the railways for traffic.

Charles F. Mervin, Jr., mechanical engineer of the United States Bureau of Standards, who must be assumed to be an expert and impartial authority, is the author of an article entitled, "A Technical Basis for

Apportioning Motor Vehicle Taxes," which appeared in May, 1930, in Public Roads, a journal published by the United States Department of Agriculture. Mr. Mervin concluded that it is "the gross weight of the loaded vehicle" which mainly determines highway damage, and consequently highway costs. Of course, there must be considered also speed and the mileage traveled. Measured by these standards are operators of buses and large trucks paying adequately for the use of the highways?

All the states now levy gasoline taxes ranging from two to six cents a gallon. One of the principal arguments advanced by propagandists of the motor bus and truck interests is, that the amount of gasoline consumed by a vehicle is a fair measure of the highway damage and costs that it causes, that the greater is the gross weight of the vehicle and its load the greater is its gasoline tax per mile, and that therefore through the payment of the gasoline tax large vehicles are paying proportionately with small vehicles for the use of the public highways.

Effect of Gasoline Taxes

The fallacy in this argument is easily demonstrated. A Ford passenger automobile weighs about one ton and runs about 20 miles in consuming a gallon of gasoline. Assuming that the tax is four cents a gallon, which is the rate in 18 states, the owner of a Ford car moves the equivalent of 20 tons one mile over the highway for a gasoline tax of four cents. A 10-ton truck and its load, having a gross weight of 16½ tons, will run three miles while consuming a gallon of gasoline. Therefore, the owner of such a truck moves the equivalent of 49½ tons one mile over the highway for a tax of four cents. In other words, his gasoline tax *per ton-mile* is considerably less than one-half as much as that of the owner of a Ford car. A motor bus weighing eight tons will run seven miles on a gallon of gasoline, and, therefore, by paying the tax on one gallon of gasoline, its operator gets the use of the highway for the equivalent of moving 56 tons one mile. In proportion to his ton mileage, in other words, he pays in gasoline taxes only a little more than one-third as much as the owner of a Ford car.

Calculating in another way, and still assuming a four cent tax, it is found that the gasoline tax per 100 ton-miles for various vehicles is as follows: Ford passenger automobile, 20 cents; average passenger automobile (weight 1½ tons), 17.9 cents; Ford truck (gross weight 2¼ tons), 14.8 cents; two-ton truck (gross weight 4¼ tons), 11.8 cents; five-ton truck (gross weight 9¼ tons), 8.7 cents; 10-ton truck (gross weight 16½ tons), 7.9 cents; motor bus (eight tons), 7.1 cents.

These figures do not show, and are not given to show, that gasoline taxes for motor vehicles in general are either too high or too low. They are given to demonstrate, and they do demonstrate, that when all classes of motor vehicles pay the same gasoline tax per gallon, heavy vehicles, such as motor buses and large trucks, through the levying of the gasoline tax, pay much less in proportion for their use of the highways than do light vehicles, such as private passenger cars and small trucks.

Inconsistent State License Fees

All the states charge license fees for the use of the highways. Because for motor buses and large trucks they are higher than for private automobiles and small trucks, it is claimed that operators of buses and trucks through these fees pay proportionately with owners of other vehicles for the use of the highways. Statistics disseminated by the National Automobile Chamber of Commerce disclose some astonishing facts regarding these license fees. For example, the state license fees for a three-ton truck with solid tires ranged in 1930 from as low as $18 in Missouri to as high as $937.50 in the adjacent state of Iowa; from $35 in Tennessee to $881.25 in Arkansas; and from $95 in Kentucky to $900 in North Carolina. The National Automobile Chamber of Commerce gives $298.22 as the average fee in all the states. As a matter of fact, in 29 states the license fees were less than this figure, and, in these states, averaged only $118.26. In 19 states the license fees exceeded the average given by the National Automobile Chamber of Commerce, and in these states averaged $573.07. In other words, in 19 states the license fees averaged almost 400 per cent more than in the other 29 states.

If the registration fees charged trucks in California, Arkansas, Florida, Iowa, North Carolina, South Carolina, and Wisconsin, in which for three-ton trucks they range from $750 to $950, are not excessive, then certainly the trucks are subsidized in the 29 states in which the license fees for a three-ton truck range from $300 down to $18, and average only $118.

The facts demonstrate that as between different classes of motor vehicles, and from state to state, there is almost no relationship between taxation and the cost caused the public by the use of the highways. In a very large majority of the states there is rank discrimination against the private motorist and in favor of operators of large buses and trucks.

According to Mr. Mervin, roads two to five times as strong are required for buses and heavy trucks, depending on their weight, as for passenger automobiles and small trucks. Until the operators of motor buses and heavy trucks are forced in every state to pay the entire additional cost of construction and maintenance caused by their use of the highways they will be indefensibly subsidized at the expense of the private motorist and the general taxpayer in their competition with the railways. Only when all the costs of highway transportation are paid through the rates charged those to whom the service is rendered will it be possible to determine, on sound economic principles, what traffic should move by highway and what by rail.

A New Era for the Railroads*

Faith in the integrity, energy and inventive genius of railroad officers— Will they receive square deal from government?

SECRETARY of War, Patrick J. Hurley, in an address before the Mississippi Valley Association, November 24, is quoted as saying:

"Whatever high state of development water transportation may reach, the railroads will remain the backbone of our national freight transportation system."

The Bureau of Railway Economics in its report entitled "An Economic Survey of Inland Waterway Transportation in the United States," October 15, 1930, includes an analysis of the commercial freight traffic within the confines of the United States for 1928, showing its distribution among the several transportation agencies. Excluding the Great Lakes System, the distribution is as follows:

	Ton Miles	
Steam Railways	477,244,000,000	90.2%
Motor Trucks (Interurban)	10,276,000,000	1.9%
Electric Railways	1,270,000,000	.2%
Pipe Lines	30,000,000,000	5.7%
Airplane	1,210,000,000	.2%
Inland Waterways (excluding Great Lakes)	9,336,000,000	1.8%
	529,336,000,000	100.0%

These percentages can be brought up to date by the general statement that the railways' ton mileage for 1929 was the greatest in the history of the industry. The fall of 14.2 per cent in the operating revenues of Class I railroads for the first eight months of this year corresponded approximately to the recession of general business as indicated by various indices and statements and figures emanating from the other competitive industries, indicating that these forms of transportation have suffered likewise from the general business depression.

Under date of December 14, Secretary of Commerce Robert P. Lamont in his report on general conditions stated the traffic of railroads was naturally affected by the decline in the production of commodities, but the ton mileage carried by the railroads in the fiscal year 1930 has been surpassed in only three other years. (Government fiscal year ended June 30, 1930.)

It is particularly interesting to note that according to the statement of the Interstate Commerce Commission, December 1, 1930, the passenger business of the railroads for the eight months of 1930 has declined in a slightly smaller ratio than the freight business, the figures given being as follows: Freight revenues off 13.88 per cent; passenger revenues off 13.63 per cent. To be sure the difference is slight, but it at least supports the contention that the loss of passenger business to motor busses and passenger cars is meeting with resistance.

The public has become so blinded by automobile headlights, so conscious of the size of the busses and trucks on the public highways, so impressed with the hundreds of millions of dollars being spent by the government on waterways and has become so air-minded, that it has lost its perspective and is quite unconscious of the work that is being done and must be done every day by the railroads to maintain the American standard of living. Our great metropolitan cities have grown around the railroads and our civilization is such a delicately balanced mechanism that the whole structure would be thrown into confusion were the railroads of the country to cease operating for a single day.

Accomplishments of the Railroads Under the Heading of Service

The transportation machine as represented by the railroads of the country consists of 249,433 miles of track. It represents as of 1929 an investment of $25,465,036,000. The total railways' capitalization as of this date was $22,306,752,000, which was represented by $12,459,441,000 bonds and $9,847,311,000 stock. The ratio of debt to capital was 55.9 per cent. The net income available for dividends was $977,229,694. The ratio of earnings available for dividends to stock outstanding was 9.92 per cent.

It should be remembered that the net operating income as applied to the railroads' investment shows a small return, but because the capital structure consists of 55.9 per cent in bonds and 44.1 per cent stock, and because the majority of railroad bonds bear only a 4 per cent coupon, the operating income over and above fixed charges and taxes, plus other income, shows a higher rate on the stock capitalization. To make this clear we give two sets of figures, one showing the return on the capital invested in railroad property; second, the return on that portion of the capital represented by stock:

Year Ended	Investment (000 omitted)	Net Railway Operating Income (000 omitted)	Ratio Net Rwy. Opr. Income to Investment	Capital Stock (000 omitted)	Net Income (Includes Other Income) (000 omitted)	Ratio Net Income To Stock
June 30						
1913	$16,588,603	$806,800	4.86%	$8,599,992	$544,201	6.33%
1914	17,153,785	674,189	3.93%	8,654,215	395,632	4.57%
1915	17,441,420	694,276	3.98%	8,635,319	354,787	4.11%
1916	17,689,425	1,002,934	5.66%	8,743,106	671,398	7.68%
Dec. 31						
1916	17,842,776	1,058,505	5.93%	8,755,403	735,341	8.40%
1917	18,574,297	950,556	5.11%	9,003,796	658,225	7.31%
1918	18,984,756	646,223	3.40%	8,846,716	442,336	5.00%
1919	19,300,120	454,132	2.35%	8,883,124	496,609	5.59%
1920	19,849,319	12,100	.06%	8,843,100	481,951	5.45%
1921	20,329,223	601,138	2.95%	8,889,920	350,540	3.94%
1922	20,580,168	769,411	3.73%	8,961,636	434,459	4.85%
1923	21,372,858	974,917	4.56%	9,092,933	632,118	6.95%
1924	22,182,267	984,463	4.43%	9,300,053	623,399	6.70%
1925	23,230,916	1,136,728	4.89%	9,413,100	771,053	8.19%
1926	23,880,740	1,229,020	5.14%	9,365,271	883,422	9.43%
1927	24,453,871	1,077,842	4.40%	9,539,490	741,924	7.78%
1928	24,875,984	1,182,467	4.75%	9,722,078	855,018	8.79%
1929	25,465,036	1,262,636	4.96%	9,847,311	977,229	9.92%

Investment per mile of Road, 1929 —$102,091 (Based on 249,433 miles)
Funded Debt per mile of Road, 1929— 49,951 (" " " ")
Capital Stock per mile of Road, 1929— 39,479 (" " " ")

The ratio of net earnings to capital stock for the railroad industry makes a very creditable showing over this 18-year period and would probably make a favorable comparison with most other industries were comparable figures available. As the Interstate Commerce Commission says:

* This article is the first part of an analysis of the railway situation, entitled "The Railroads—a New Era for an Old Industry" which was written by Horatio L. Whitridge of the stock exchange firm of J. S. Wilson, Jr. & Co., of Baltimore and published by that company. Further installments will be published in subsequent issues until virtually the entire study is reproduced herein. A limited number of complete copies of the study is available from J. S. Wilson, Jr. & Co., by whose permission *Railway Age* is enabled to present this interesting analysis to its readers.—EDITOR.

"Fortunately for their financial position, their capitalization in recent years has not kept pace with their investment, and the relation of their net income, after interest charges and all taxes, to their capital stock was never better in their history than it was in 1929."

During the year 1929 the railroads of the country employed an average of 1,660,920 people. There was paid to them the sum of $2,896,566,000. This compensation represented 46.13 per cent of the total revenues of the railroads and represented 64.26 per cent of the railroads' total expenses. This sum paid in compensation to employees represented a sum of approximately 2.3 times the amount paid for the use of capital as represented by both bonds and stock. The railroads expended $1,611,000,000 for supplies for maintaining the property and paid $396,682,634 in taxes.

During last year the railroads of the country carried 780,468,000 passengers 31,074,135,000 passenger miles, for an average journey of 39.81 miles per passenger. Of these passengers only 97 were killed. Insurance statistics show that there are few places where human life is as safe as in a modern steel passenger coach.

For the single year ended December 31, 1929, the railroads charged to capital account and operating expenses $297,929,082 for the "Improvement of safety and protection," which item included grade crossings, train control and signal devices.

It is an amusing commentary on the mental attitude of the public towards the railroads that the National Automobile Chamber of Commerce in reporting the 1929 motor fatalities should make this naive statement: "These figures do not include grade-crossing collisions with railroad trains, following the U. S. Bureau of Census procedure, which charges the accident to the heavier vehicle."

In the efficient handling of freight the railroads have accomplished wonders in recent years. The average speed of all freight trains has been stepped up to 13.7 miles per hour between terminals, including yard and road delays, no matter from what cause. Fast expresses run on regular schedule with the precision of passenger trains. Third morning deliveries are made between Chicago, St. Louis and the Atlantic Seaboard points, a distance of 900 to 1,000 miles.

At the 42nd Annual Convention of the National Association of Railroad and Utilities Commissioners, President Webster said:

"It would be a real catastrophe to lose the splendid service the railroads are giving, as never in history have we had such satisfactory service. When formerly it took from four to six weeks to move a car of lumber from the Coast to the Middle West, now that car is moved in ten days or two weeks. Where formerly live stock remained in stockyards for weeks awaiting cars, now they are obtainable on demand. Any business man appreciates the great saving of this class of service. The problem is to guard them from their own mistakes, from fanatics, and protect the public as well."

Also, Secretary Lamont in his annual report made a similar reference to railroad efficiency in the following words:

"Car shortages have become rare occurrences. At present it takes only from one-half to two-thirds as long to move goods a given distance as it did a decade ago. The increasing efficiency with which traffic is handled has enabled producers to make quicker deliveries and distributors are able to carry smaller stocks and to turn over their capital more quickly."

The saving of loss of interest on capital involved in goods in transit and the saving made possible through keeping less capital frozen up in inventory may well amount to over $100,000,000 a year.

Returns Received by the Railroads from the Public for Services Rendered

Chipping away at railroad rates from its economic aspect can be compared to whittling a stick; the shavings are of no value, and in the end the stick disappears. The agitation for the reduction of freight rates originates with legislators and commissioners in the role of public benefactors, from civic trade bodies in their desire to overcome natural advantages enjoyed by their neighbors, from trade organizations for the purpose of adding to the margin of profit in the industry they represent. This agitation is represented as being on behalf of friend John Smith, the man in the street, but John Smith is not much concerned, for he has learned from experience that freight rates have been used as one of the excuses for high cost of living, but on the other hand, he has never bought anything cheaper, because the Interstate Commerce Commission has from time to time ordered reductions in the freight rates on commodities that go into his daily budget.

The reason is that the service rendered by the railroads is the cheapest element that enters into the American standard of living, and the cost of the same as it applies to the individual is made up of so many infinitesimal fractions distributed over so many separate transactions that a change in the rate downward can hardly be translated into "the coin of the realm."

To illustrate, the entire railroad bill for freight and passenger services rendered by Class I railroads during the year 1929 was $6,279,520,000, which, based on the present population of the country of one hundred twenty-three millions, represents an annual cost of railroad service per individual of $51.05, or a daily average cost of 14 cents per capita.

Assuming a general reduction of 5 per cent in both passenger and freight rates, the saving per annum to the average individual would be $2.55, and the average saving per diem would be 7 mills. Figures such as these were possibly in the minds of the Interstate Commerce Commission when it stated, "However, the country still needs its railways and can support them."

This is still more apparent when it is realized that estimates indicate the American people spent in 1929 in the neighborhood of $11,000,000,000 in the operation of the 23,000,000 registered automobile passenger cars; $900,000,000 in moving picture theatres, and approximately $800,000,000 for radio instruments and parts. These three items, which might be classed under the heading of luxuries, aggregate alone a sum over twice as large as the country's total railroad bill.

To paint the picture another way, suppose John Smith takes his Ford and goes shopping, and his purchases consist of a suit of clothes, a bag of flour, a pair of shoes, a bag of potatoes and a pound of meat, spending in the aggregate $44.95. On the way he stops to see a good moving picture, spending therefor 35 cents. By the time he reaches his home on the outskirts of town he has traveled five miles at a cost of 4 cents a mile, or 20 cents for the trip. The proportionate amount of John Smith's expenditures that would accrue to the railroad under present rates and the saving that he could have made had a 5 per cent cut in freight rates been effective is set forth as follows:

TO BALTIMORE, MD.

	Retail Cost	Weight	From	Freight Rate per 100 Lbs.	Freight Rate per Single Article	5% Reduction in Freight Rates
1 bag flour	$ .80	24 lbs.	Minneapolis, Minn.	$.405 (Car Load)	$.0972	$.00486
1 pair shoes	5.00	2 "	St. Louis, Mo.	1.630 (any quantity)	.0326	.00163
1 bag potatoes	3.90	150 "	Oakfield, Me.	.575 (Car Load)	.8625	.04313
1 pound fresh meat	.25	1 "	Chicago, Ill.	.760 (Car Load)	.0076	.00038
3 yds. cloth for suit	35.00	5 "	Lawrence, Mass.	.780 (any quantity)	.0390	.00195
	$44.95				$1.0389	$.05195
Percentage of retail price represented by freight charges					2.3%	Possible saving, .12%

How could the tailor credit John Smith with 2 mills on the cost of his suit because there had been a reduction in the cost of shipping bolts of cloth from Lawrence, Mass., to Baltimore, Md.? How could the butcher make him an allowance of .00038 on the minute steak because there had been a reduction of 5 per cent in the rate for fresh meat from Chicago per 100 pounds? So John Smith is satisfied with his purchases, but he is a different man next day if he is told by the foreman that there will be no work for the erectors because the structural steel has been delayed in transit, or the new machinery for the factory has not arrived, or the mine must shut down for lack of cars. John Smith is mad for now it is a question with him of dollars, not mills.

The relation of freight rates to cost of commodity, given above, may be considered typical. There are, however, commodities in which the freight rate represents a substantial part of the cost of the article to the public; on the other hand, there are articles where the freight rate represents even a smaller proportion than those shown. Two commodities representing the two extremes are probably coal and silk.

It has been contended by some that the railroads could develop more coal traffic if they reduced the freight rate. Were the railroads an independent agency, they might attempt this form of merchandising, but unfortunately for them they are not permitted to experiment. Rates are not flexible. It is easy to reduce a rate, but it would be almost impossible to raise it again, should the experiment not prove a success.

When will the politicians stop trying to delude John Smith that he is better served by a starved industry than a prosperous one?

So while "the man in the street" gets no benefit from the chips that result in a reduction in freight rates, there are others that feel the *full blow of the axe*.

The number of persons employed in railroad service in 1929 averaged 1,660,920 and received total compensation of $2,896,566,000, or an average of approximately $1,744 per individual. It is upon these railroad employees and the millions of railroad bond and stockholders upon which the blow of the axe falls most heavily, and if the reduction in freight rates is timed to coincide with a business depression, the result may be disastrous.

The railroad business is practically a cash business, the railroad dollar revolves as fast as any other dollar, and under the supervision of the Interstate Commerce Commission its revolutions are an open book. It is but necessary to set up the operating figures of the Class I roads for 1929 and to apply to their gross receipts a 5 per cent reduction in rates and a 15 per cent reduction, owing to the business depression, to see the result of such a development.

CLASS I ROADS

YEAR 1929

Total Operating Revenues		$6,279,520,000
20% Reduction would be		1,255,904,000
		$5,023,616,000
Wages chargeable to operation	$2,674,085,000	
20% Reduction would be	534,817,000	
	$2,139,268,000	
Material and Supplies and Miscellaneous chargeable to operation	$1,831,970,000	
20% Reduction would be	366,394,000	1,465,576,000
Railway tax accruals		396,683,000
Equipment and Joint Facility Rents, etc.		125,084,000
		4,126,611,000
Net Railway Operating Income—Adjusted		$897,005,000
Non-operating Income		359,780,000
Gross Income		$1,256,785,000
Interest and Other Deductions		714,662,000
Net Income Adjusted		$542,123,000

CLASS I ROADS

YEAR 1929

Net Income Adjusted		$542,123,000
Dividends	490,126,000	
20% Reduction would be	98,025,200	
		392,100,800
Surplus after Dividends—As Adjusted instead of $406,690,000.		$150,022,200

In the above table it has been assumed that taxes, like death, are unavoidable, that the payment of interest is the only alternative as against bankruptcy, and therefore the $1,255,904,000 representing the cut in volume of business and rates has to be sweated out of the purchase of supplies, wages, capital expenditures and dividends. The railroads are collectively the largest purchasers of supplies in the country. Their requirements give employment to millions in other industries. Dividends are no longer paid to the wealthy few, but represent the return on the savings of hundreds of thousands of American citizens. The Pennsylvania Railroad alone pays dividends to 232,491 registered stockholders.

Limiting Factors of Competitive Forms of Transportation

Secretary of War, Patrick J. Hurley, under whose jurisdiction the inland waterways have been placed, in an address before the Mississippi Valley Association on November 24, 1930, said:

"We must seek the co-ordination of railroads, waterways, highways, pipe lines and airways. The nation's increasing industrialization demands all these. It will support all of them, and the closer they are co-ordinated the more will they prosper, each in its own domain."

John Smith, taxpayer, cross-section of the nation, knows he will support all these various methods of transportation, because, except for the railroad and the pipe line, they are charged up to him on his tax bill. The expenditure of billions of dollars by the government, states and municipalities for waterways, highways and municipal airports make impressive reading and give John Smith a feeling of pride, but he cannot help wishing they were *self-supporting*, and he hopes they will be prosperous, for he is staggering under the burden of taxation.

He is reminded of the economic truth as propounded by Messrs. Moran and Mack, that white horses eat more than black horses—because there are more of them.

In its last report the Interstate Commerce Commission states:

"It is true that the freight revenue was $498,000,000 greater in 1929 than in 1920, but the prospect of a continued expansion in freight business to offset the further loss in passenger business is darkened by the completion of water lines, pipe lines and trucks, and by changes that may check the growth in demand for ton-mileage, such as economy in the use of coal, changes in the location of industry, and the relatively slow growth of population."

This statement has an ominous ring to it, but to those who have followed closely railroad history, there emanates from these few words a light that shines like a beacon of hope and may be far-reaching in its effect. For twenty-five years Congress and the Interstate Commerce Commission have looked upon the railroad industry as a monopoly, and have fostered competition among the railroads themselves, quite blinded to the progress that was being made by other forms of competition. If this paragraph means anything, it is that the Interstate Commerce Commission must exert some regulatory authority over the busses, trucks, pipe lines, etc., or must give the railroads more freedom of action to protect themselves.

The thoughtful public has no fear but that the American characteristics of energy, enterprise, and inventive genius could exert themselves in the railroad industry, but they visualize the carriers like Gulliver, unable to use his great strength in the service of the public or to work out his own destiny, lashed to the ground by yards and yards of red tape.

The valuation of the railroads has been proceeding for 17 years, and as of the close of 1929 had cost the railroads some $120,000,000 and the government $35,000,000. The Interstate Commerce Commission took nine years to present its merger program; the Recapture Clause has been in litigation for ten years and its repeal is now suggested by the Commission. Congress has been ten years finding a solution to the Muscle Shoals problem.

Such periods as the above may seem short to political bodies, but to American industry they represent an age. In the short period from 1903 to the close of 1929 the electric light and power industry has developed from an investment of $627,000,000 to one of $11,100,000,000. In the same period the automobile passenger cars have grown from 33,000 to a fleet of 23,000,000. Likewise, the radio, the aeroplane and the moving picture are products of the twentieth century and as an industry are less than thirty years old.

Where would these industries have been today had the activities of Edison, Owen D. Young, Ford, Wright Brothers, Marconi and the Warner Brothers been subject to a board of directors as deliberate as the Interstate Commerce Commission and as volatile as Congress?

So much emphasis has been given in the press, by public speakers and by railroads themselves to competition in their line of industry, that many investors have lost their sense of proportion, seeing only the difficulties of the railroads and imagining that there are no problems in connection with water lines, pipe lines, motor transport and air transport, and they visualize coal as obsolete for the creation of heat and power.

In surveying, therefore, the traffic field, it is of interest to find that all these activities also have certain limiting factors.

The result of many a battle would have been different had the general been able to appraise the strength of the enemy's reserves. If the ticker "tells the tale," the railroads' competitors are not so sure of their strategical position.

WATERWAYS

Prior to the railway era, rivers and canals were among the principal means of transportation. Development of the railways after 1865 gradually attracted much of the commerce formerly moved by water, and rivers and canals declined to a condition of comparative unimportance. The water renaissance began in the early days of the twentieth century, received a great stimulus during the World War, and since the war has been carried forward with the assistance of fostering legislation and the support of government subsidies.

The inland waterways have an aggregate navigable length of 27,406 miles, nearly 65 per cent of which is less than 6 feet in depth. Nearly half of this length, or 12,475 miles, is comprised by the Mississippi-Ohio System, of which 71 per cent is less than 6 feet in depth. This Mississippi-Ohio System is the backbone of the program for waterway development in the United States and has absorbed about four-fifths of the total government expenditures for this purpose. Total government expenditures on this system, from 1924 to June 30, 1929, exclusive of flood-control expenditures, were $468,981,924. It is estimated that an additional expenditure of over $97,000,000 will be required to complete the project. The amount that may be said to have been spent for new work, exclusive of maintenance, etc., is in the neighborhood of $322,000,000, or about $25,800 per mile.

The New York State Barge Canal, which has been referred to as New York State's "White Elephant," is at present 525 miles long. Exclusive of any costs from its beginning in 1817 to 1905, when work on improvement was begun, total cost since 1905, according to a study made by the Bureau of Railway Economics has amounted to over $176,000,000. This cost amounts to about $335,000 per mile.

In comparing transportation by inland waterway with transportation by rail, it must be borne in mind that distance between two points by river is almost invariably greater than by rail. This can best be illustrated by the following table:

RELATIVE DISTANCES IN MILES BY RIVER AND RAIL

From	To	River	Rail	Excess River Distance
New Orleans	St. Louis	1,164	718	62.1%
St. Louis	Minneapolis	687	588	16.8%
Pittsburgh	Cairo	979	648	51.1%
Kansas City	St. Louis	408	278	46.8%
Sioux City	Kansas City	416	289	**43.9%**
Birmingham	New Orleans	584	355	64.5%

Thus, in comparing transportation costs between points on the Mississippi-Ohio System, an average of 50 per cent excess water haul must be taken into consideration.

The average speed of freight trains between terminals for eight months of 1930 was 13.7 miles per hour. The average speed for barges probably is not more than 5 miles per hour. Thus, taking into account also the 50 per cent greater distance traveled, there is an average ratio of approximately 1 to 4 in the time element between rail and water transportation. That is to say, the shipper's working capital is tied up four times as long when shipping by water than by rail. This handicap the government tries to equalize by arbitrarily fixing water rates 20 per cent below that of the railways.

Another factor in water transportation is the elements. The New York State Barge Canal is often ice-bound five months and the Upper Mississippi four months, each year. In the last several years millions of tons of freight destined for transport by inland waterways have, because of floods or drought, been rerouted by rail.

The Bureau of Railway Economics has computed the true comparative cost of transportation by water and rail by including interest at 4 per cent on expenditures for construction, which hidden cost is borne by the people as a whole. A table of these costs is given below:

TABLE OF COMPARATIVE COSTS FOR 1929 BY RAIL AND WATER ON A COMPARABLE BASIS

	Cost per ton-mile in mills	
	Water	Rail
Mississippi River	11.17	10.09
Ohio River	12.36	8.83
N. Y. State Barge Canal	19.41	10.90

Evidently the taxpayer is "holding the bag."

Man's ingenuity in making tonnage flow up hill by means of canals and locks is probably the most expensive of all forms of transportation. Waterways are cheap only when supplied and maintained by nature, free of cost.

The American people are willing to pay a premium for speed, but the federal government and various states are spending hundreds of millions of the taxpayers' money in attempting to revive the slowest form of transportation.

PIPE LINES

The pipe-line industry is not new, the Eureka Pipe Line Company having been organized in 1890. According to the Bureau of Railway Economics, 37 pipe-line companies reporting to the Interstate Commerce Commission for 1929 operated 85,796 miles of pipe and had a property investment of $741,000,000. This represents an investment of $8,637 per mile.

These pipe lines were used chiefly in transporting crude oil, and have been in competition with railways

for years. Traffic statistics produced by Mr. E. B. Reeser, president of the American Petroleum Institute, show that in spite of the expansion of pipe lines in recent years, the volume of petroleum and refined products has assumed an increasing percentage of the total railroad movement. He states that the gain in this class of tonnage on Class I railroads for 1929 was 41.8 per cent over 1924, against a gain of 13.5 per cent in all traffic. For the first six months of 1930, the gain was 3.5 per cent over the corresponding period of 1929, while total carload traffic suffered a 9 per cent decline.

In some instances the pipe lines are financially interested in the commodity they transport, and at the same time serving as common carriers, a procedure which has been debarred to the railroads by law.

A comparatively new development is the gasoline pipe line now under construction or projected. An example is the Great Lakes Pipe Line Company, controlled by Barnsdall and Continental Oil, which plans to construct a 1,400-mile line from Texas to Chicago, to cost upwards of $12,000,000, or approximately $8,600 per mile.

The Rock Island, operating in the oil fields of Texas and serving approximately the same cities as this projected pipe line, is capitalized at $50,335 per mile. The ratio of the petroleum tonnage to its total tonnage represents approximately 9 per cent, or an approximate capitalization of $4,500 per mile for the petroleum part of its business. In addition to its passenger business, this railroad carried tonnage in 1929 distributed as follows:

Products of Agriculture	22.63%
Products of Animals	4.30%
Products of Mines (including Oils)	35.98%
Products of Forests	4.72%
Manufactures and Miscellaneous	28.97%
All L. C. L. Traffic	3.40%
	100.00%

It is possible the railroad is as economical as the pipe line, when the latter is operated as a common carrier only. As an investment, the railroad offers a better distribution of risk. As a public convenience and necessity, the railroad is a greater asset to the territory it serves than the pipe line, and there is no evidence that the refineries themselves can dispense with rail connections.

Another angle to the situation has been pointed out by Ernest L. Nye, president of the National Steel Car Lines Company, who states that the capacity of gasoline pipe lines under construction and projection is about the average annual increase in consumption of gasoline. This would still leave to the railroads their present amount of business, assuming that these new lines operate to capacity. Railroads could also meet pipe-line competition by special "Tank Train" rates, which have not so far been legalized.

The third development in this field is the natural gas pipe line, which, according to some predictions will further reduce the use of coal and take away from the railroads a large part of their coal traffic. The Houston Pipe Line Company, organized in 1925, cost in the neighborhood of $23,600 per mile. Another pipe line now projected is estimated to cost $40,000 per mile. The natural gas line from Texas to Chicago, sponsored by the Insull, Cities Service, Standard Oil of New Jersey and Texas Corporation interests, is estimated to cost over $100,000 a mile. Moreover, companies distributing natural gas must maintain standby gas manufacturing plants in condition, to guard against any interruption to service, the interest upon the investment being included in the rate charged the consumer.

At the convention of the National Association of Railroad and Utilities Commissioners, the Honorable Alexander Forward, managing director of the American Gas Association, is reported to have said:

"At some more or less remote day, when the natural gas supply approaches depletion and becomes consequently too expensive for competition with other fuel, some of its pipe lines may be used for long distance transmission of manufactured gas."

Evidently, the Honorable Alexander Forward, speaking for the natural gas interests, expects the railroads to be still in existence at some "more or less remote day," and be ready to haul coal for the manufacture of gas.

AEROPLANES

Aeronautics is first mentioned in Greek mythology when Icarus fastened wings to his shoulders with wax in order to visit the gods, but when he approached the sun the heat melted the wax, and he fell into the Icarian Sea and was drowned.

Modern aviation, however, dates from 1903, since which time rapid strides have been made in the development of the aeroplane, but as an economic factor it is still in its infancy. Thus, people who recently visualized the air peopled with airplanes and great air liners crossing the oceans on schedule time, lost sight of the time element.

The Sixteenth Annual Report to Congress of the National Advisory Committee for Aeronautics showed that there was a 300 per cent increase in paid passengers for scheduled air transport during the first six months of 1930, over the corresponding period for 1929, which is at the rate of 416,700 passengers per annum, but when it is remembered that 780,468,000 passengers were carried by train in 1929, it develops that the airplane passenger service represents only about .05 per cent of the performance by the railroads. This does not indicate any serious invasion of the passenger business of the railroads, and when reports of typical air-transport companies are examined, it appears that the passenger traffic of these companies has not yet been established on a really profitable basis.

For instance, Transcontinental Air Transport, Inc., sponsored by and operated in conjunction with the Pennsylvania Railroad, showed a capitalization on December 31, 1929, of $5,214,464, and for the period from July 8, 1929, to December 31, 1929, operations showed a loss of $986,591. Dow, Jones and Company attribute the loss from operations as due to high cost of equipment and high operating expense. Although practically all planes were carrying capacity loads, expenses had been pared down and the company was operating at a high degree of efficiency, actual cost of operation per mile, it was said, was far in excess of revenue, and it was doubtful if profit could be made from passenger operations alone for some time.

In the carrying of mails only, in the immediate future, is the aeroplane likely to prove a serious factor in the railroad situation. However, the revenue earned by all railroads in the country in 1929, for carrying the mails represented only 1.79 per cent of the total revenue of these roads for the year. The percentage, therefore, of this small proportion of the railroads' gross earnings that the aeroplanes are actively competing for will be governed by the amount of the subsidy that the government will grant to the aeroplane, and the time saved in delivery of mail from central post office to central post office.

A large part of the cost of developing air transport lies in the expense of building and maintaining landing fields. The City of Baltimore has appropriated $4,000,000 for a municipal airport, and private capital invested over $5,000,000 in the Roosevelt Flying Field, on Long Island, adjacent to New York City. Operating figures for a complete year are not yet available, but judging by the open market quotations, the public appraises the value of this property, under present conditions, at only $585,000, and the stockholders seem to view the possibilities of dividends as very remote.

According to the Department of Commerce, "there

has been a substantial increase in schedule flying for the first half of 1930."

The latest figures for all air transportation operators for this period are as follows:

Miles flown	16,902,728
Passengers carried	208,357
Express carried (lbs.)	1,548,091
Air mail (lbs.)	3,761,376
Mail payments to operator	$6,954,808
Passenger miles flown	51,609,749

If these millions of pounds of express and mail are reduced to tons, the resulting figures are 774 tons of express matter and 1,880 tons of mail. These two tonnage figures together would make up one good-sized freight train load. It has been stated that there are 1,813 landing fields in this country, and 809 more have been proposed. Using the cost of the Roosevelt and Baltimore flying fields as a criterion, it is possible that the country has in recent years expended for flying fields over $1,000,000,000. This investment indicates rather a heavy terminal charge for the total of 2,654 tons moved by aeroplane in six months.

The aeroplane will no doubt greatly develop in years to come, but the conservative investor, in the meantime, may indulge in air-mindedness with his feet on the ground.

MOTOR TRANSPORT

In 1904 there were 410 busses and trucks registered in the United States. In 1929 this figure had grown to nearly 3,380,000. The bus and truck business does not seem immune from the general business depression, for an article in the Wall Street Journal on November 15, 1930, states that 400 permits for operation of motor truck and motor bus lines in Texas had been canceled for various reasons, among which were non-payment of state taxes and failure to keep up insurance on passengers. The U. S. Daily, on December 10, 1930, states that of a total of 146 bus lines operating in Indiana, 44 conducted business at a loss.

In view of the steps taken by a number of Western roads to reduce passenger fares for certain types of service, it is interesting to note what the New York Herald-Tribune had to say, under date of October 1, 1930, on the rail and bus competition:

"The president of the National Association of Motor Bus Operators, in an address yesterday at the association's convention at Chicago, declared that a rate war between bus operators and the railroads would be detrimental to both and should be avoided. In the past, when any railroad has made a determined effort to cut rates to compete with a bus line, it has only been a matter of a short time before the bus company was out of business, for when rail rates begin to approach those of the bus systems people usually prefer the trains."

A circular in connection with recent financing of the Pennsylvania Greyhound Lines states that for 1929, gross revenues of inter-city bus lines amounted to about $201,000,000, collected from 422,000,000 passengers carried over approximately 300,000 miles of route, or a gross revenue of $667 per mile of route.

In 1929, the steam railways in the United States owned over 249,433 miles of road, and paid approximately $396,683,000 in taxes, or over 6 per cent of their operating receipts, which represents a tax of about $1,500 per mile, for operating their own roadbed. Assuming the taxes paid by the railroads were applied to 300,000 miles of bus routes, the receipts from this source would amount to over $1,300 per mile, or nearly twice the gross average receipts of bus lines. A 6 per cent tax of gross receipts of bus lines would produce only $40 per mile per annum for road maintenance.

In 1929, according to the National Automobile Chamber of Commerce, 50,000 miles of roads were surfaced at an expenditure of $1,500,000,000, or $30,000 per mile. On this basis, it would cost the Pennsylvania Greyhound Lines $180,000,000 to surface its 6,000 miles of route. Interest on this amount at 5½ per cent would amount to $9,900,000 per year, or $1,650 per mile. Gross receipts of this company for the year ending August 31, 1930, amounted to $6,523,500, or $1,087 per mile. Thus, it would seem that even a prosperous bus line could not pay interest on the cost of the highways on which it runs, and could not maintain them if received as a gift.

Contrasting the motor truck and the railroad as a freight-moving machine, the difference in man-power is interesting. For 1929, the Pennsylvania Railroad reported an average of 28.4 tons of revenue freight per loaded car, and an average of 35.4 loaded cars per train. This would mean 1,005 tons per train, and, with an average crew of five men per train, 201 tons moved per man. Assuming one man per five-ton truck, it would require 201 men to move the same amount of freight by motor truck that could be moved by five men by means of the railroad.

Thus, motor truck operations cost per ton-mile several times the average ton-mile expense of steam railroads, but the flexibility of the motor truck has compensated for this by greater convenience in store-door delivery. The position of the motor-truck operator, however, would be precarious should the railroads decide, or be permitted, to combine the advantages of the convenience of the truck with the low cost haul of the railroads.

Bills for the regulation of trucks and busses in interstate commerce are now before Congress, and regulatory bills are in process of presentation before several state legislatures.

The operator of motor truck and bus is haunted by the spectre of obsolescence—one unprofitable year in his business represents the loss of almost 20 per cent of the useful life of his equipment.

(The second installment of Mr. Whitridge's competent analysis of the present railway situation will appear in an early issue of *Railway Age*.—EDITOR.)

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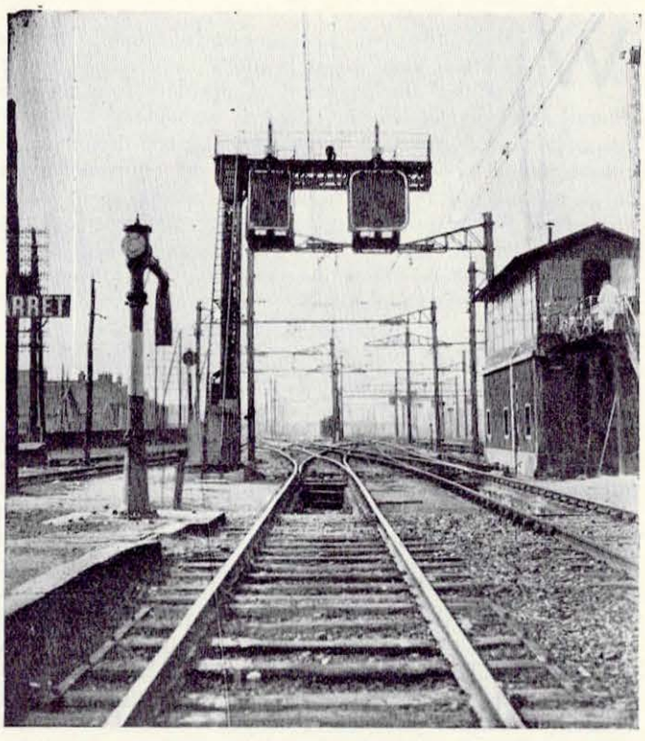


A Signal Tower on the Electrified Section of the Paris-Orleans, France

The Rehabilitation Has Included Extensive Line and Grade Revisions

Rehabilitating the Cotton Belt

Rebuilding of this property, which was begun in 1923, has already effected marked economies in maintenance and operation

WHEN the St. Louis Southwestern, or the "Cotton Belt" as it is more familiarly known, resumed the payment of dividends on its preferred stock in November, 1922, it was faced with two important problems: A large accumulated deficit in its maintenance of way, and a shortage of equipment. A large amount of reconstruction was necessary in order to permit better operation, and many obsolete locomotives had to be replaced. To overcome these handicaps, as well as to lower the cost of operation, an extensive plan of rehabilitation covering a period of years, which will result in a substantial decrease in maintenance costs, was announced.

The Cotton Belt situation is peculiar in many respects. The territory which it serves is still in the development stage, and a considerable part of the mileage of the system is in that section of the country which is affected by floods from the Mississippi river and its tributaries. This road has never been an important passenger carrying line. Such passenger traffic as it does handle is largely local or short-haul, except the Lone Star which runs between Memphis, Shreveport, Dallas and Ft. Worth, and for a period of 12 years or more it has shown a constant decrease in passenger revenues of about 15 per cent a year.

Investigations disclosed that, in 1927, about 50 per cent of the local passengers formerly handled by this company had been diverted to privately owned vehicles and about 25 per cent to motor coaches. The Southwestern Transportation Company was formed to operate motor coaches for the purpose of handling not only the passenger traffic then using this form of transportation, but also the 25 per cent which still used the railway. This subsidiary company now operates more than 1,600 route miles, paralleling practically all main and branch lines of the railway, as a result of which 317,550 passenger train miles a year have been discontinued and a further reduction is contemplated.

Freight Traffic

The flow of freight traffic on the Cotton Belt is not steady and continuous, but is subject to wide and, at times, violent fluctuations. For some years the nature of the traffic has been undergoing a marked but steady change from bulk commodities, particularly forest products, to a lighter loading, consisting of farm and manufactured products. A substantial part of this traffic either does not originate at or is not destined to points on the road, while comparatively little of it has both its origin and destination on the line.

The tonnage originating on the system constituted 71 per cent of the total handled in 1910. By 1928 this had declined to 52 per cent, while during 1930 approximately 36 per cent was overhead traffic, that is, traffic that has neither origin nor destination on the lines of the system. This latter compares with 22 per cent for all of the roads in the Southwestern region. Since 1910, although subject to wide variations, the ton miles

of traffic handled has shown a steady average increase of about four per cent a year. The plans for yard and other facilities and for motive power and equipment were, therefore, based on a continuance of this rate of increase for some years to come.

This increase has been accompanied, however, by two important changes in the nature of the traffic, which presented serious problems of operation. The change from forest products to lighter loading commodities has been mentioned. The inevitable effect of this change was to reduce the revenue level of the tonnage handled. The second problem arising from this change in the character of the traffic was the demand for increased speed and the necessity of reducing the train load in order to meet this requirement. As a result, fast freight schedules were shortened as much as 30 per cent in order to enable the road to participate in this traffic. This demand for greater train speeds made it necessary to bring the track and roadway up to a high standard of maintenance, to modernize its motive power and cars, to improve its yards and terminal facilities, and to reduce the heavy grades southwest of Pine Bluff, Ark.

The Rehabilitation Program

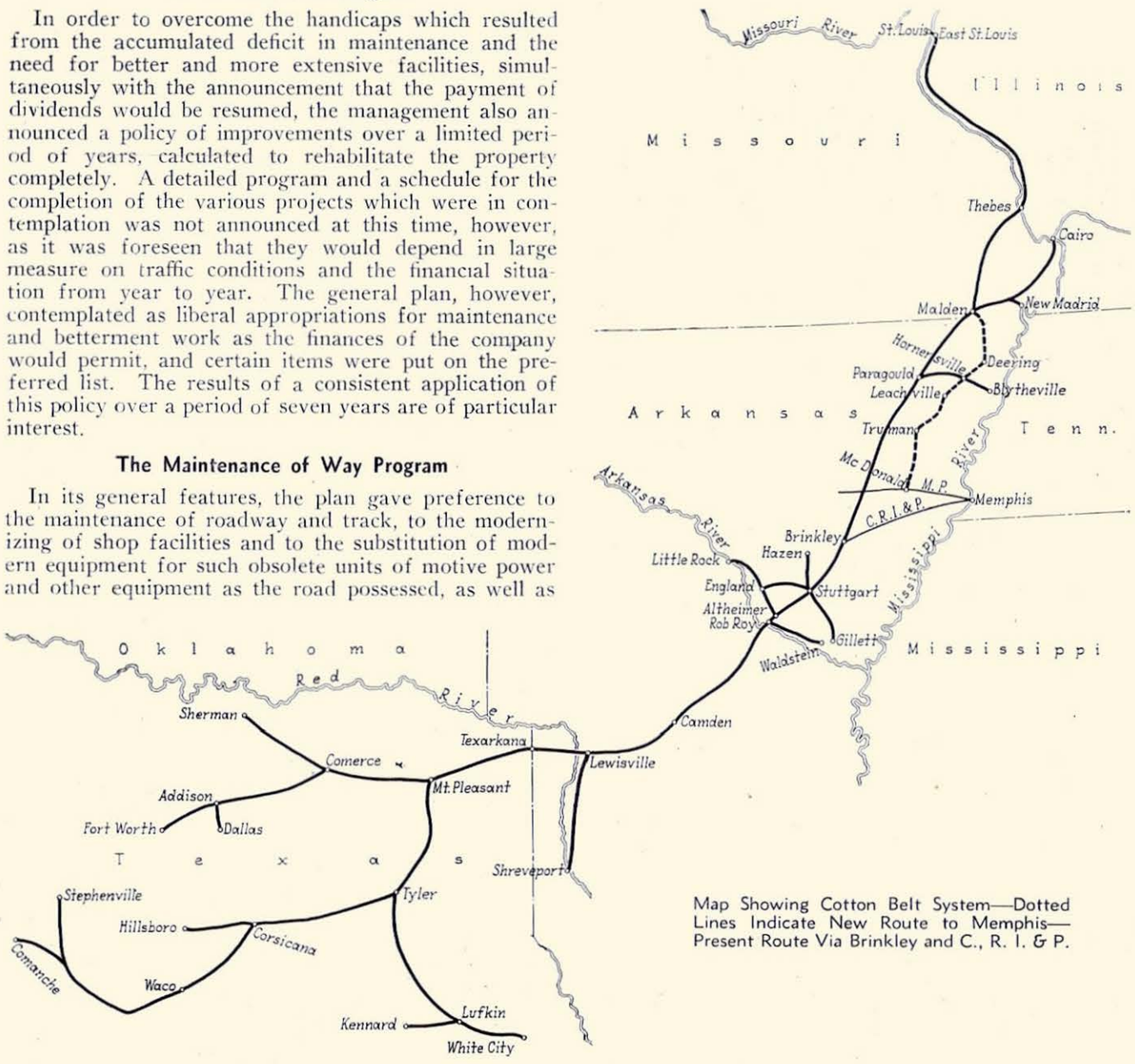
In order to overcome the handicaps which resulted from the accumulated deficit in maintenance and the need for better and more extensive facilities, simultaneously with the announcement that the payment of dividends would be resumed, the management also announced a policy of improvements over a limited period of years, calculated to rehabilitate the property completely. A detailed program and a schedule for the completion of the various projects which were in contemplation was not announced at this time, however, as it was foreseen that they would depend in large measure on traffic conditions and the financial situation from year to year. The general plan, however, contemplated as liberal appropriations for maintenance and betterment work as the finances of the company would permit, and certain items were put on the preferred list. The results of a consistent application of this policy over a period of seven years are of particular interest.

The Maintenance of Way Program

In its general features, the plan gave preference to the maintenance of roadway and track, to the modernizing of shop facilities and to the substitution of modern equipment for such obsolete units of motive power and other equipment as the road possessed, as well as the addition of units needed. Among the first items given attention were the widening of cuts, the strengthening of embankments and provisions for adequate drainage, since it was realized that these constituted the foundation upon which to build a better and stronger track structure. A width of roadbed was adopted which conforms to American Railway Engineering Association standards.

In many cases surface ditches were too close to the track, and it was necessary to move them further away. French drains were installed and perforated galvanized iron pipe drains laid in embankments to cure soft spots. In general, the widening of cuts and the strengthening of embankments was undertaken as a part of the preparation for reballasting. At this time subsurface drains were installed in cuts and surface ditches were reconstructed to conform to the standards which had been adopted as a preliminary to the rehabilitation work. In the six years from 1923 to 1929, inclusive, $380,000 was spent in restoring the roadbed and $275,000 to provide adequate drainage, a total of $655,000.

The program outlined in 1922 contemplated the reballasting of 1,000 miles of main and important branch



Map Showing Cotton Belt System—Dotted Lines Indicate New Route to Memphis—Present Route Via Brinkley and C., R. I. & P.

line tracks and the application of ballast to about 300 miles not previously ballasted. When the work on this program was started in 1923, the accumulated maintenance obligation amounted to 636,000 cu. yd. of ballast. In addition to this purely maintenance requirement, the new standard of track maintenance required an additional depth of ballast under the ties, so that the total requirements for the track that was already ballasted were considerably greater than was indicated by the maintenance needs only.

As the traffic north of Paragould, Ark., is heavier than on the remainder of the system, stone ballast is used here and gravel for other main lines and branches. A new pit containing an abundant supply of excellent gravel for ballast was opened on the Ouachita river, at Britton, Ark., near Camden, In 1923. During that year 327,000 cu. yd., of gravel were obtained from this pit, of which 166,000 cu. yd. were used in maintenance and 161,000 cu. yd applied as betterment. The pit has been operated continuously since that date, and at the end of 1929 the deficit in the maintenance requirements was wiped out, while large quantities had been applied for betterment purposes. Ballast has also been applied on the line between Mt. Pleasant, Tex., and Corsicana, which was not previously ballasted, in

An Example of Track Conditions Prior to Rehabilitation

connection with the grade reduction and line revision work between these points, and this part of the ballasting was completed in 1930. It is also planned to continue the installation of ballast on branch lines until all of the mileage on the system is covered.

It is estimated that, with all lines properly ballasted, the normal requirements for maintenance will be 100,000 cu. yd. a year. The excess cost of the ballast applied since 1922, that is, above this normal requirement, has averaged $242,000 a year, so that, beginning with 1931, operating expenses will be reduced by this amount. In addition, other items of maintenance expenses should be substantially less as a result of the greatly improved condition of the track.

Renewal of Ties

At the beginning of 1923 there were slightly less than 6,000,000 ties in service on the Cotton Belt, of which approximately 4,000,000 had been given preservative treatment. A large number of the treated ties which had been inserted during federal control and immediately thereafter were soft wood ties which had been treated with zinc chloride, because of the difficulty of obtaining creosote during this period. In the territory served by the Cotton Belt, the average life of untreated hardwood ties and of softwood ties treated with zinc chloride is substantially the same, seven years. As contrasted with this comparatively short life, creosoted ties last about 18 years.

The tie condition at the beginning of 1923, if continued indefinitely, would have required the renewal of about 600,000 ties annually. If a sufficient supply of hardwood ties suitable for insertion without treatment had been available, it would have been possible to have adopted this type of tie as standard. If this had been done, within seven years, however, or beginning with 1930, the annual requirements would have been 865,000 ties. It was decided, therefore, to adopt creosoted ties as standard. By doing this a condition was reached at the end of 1930 whereby all of the ties in service are creosoted and tie plated and, hereafter, the annual requirements will drop to an average of 335,000 ties. The initial cost of raising the standard to this basis was $3,500,000, but, beginning with 1931, it is estimated that the operating expenses for tie renewals will be reduced by $450,000 a year.

Rails and Other Track Material

On a line having a traffic density and rate of increase similar to that of the Cotton Belt, experience has shown that rail having the proper section to support the traffic should be renewed at intervals of about 20 years. The main lines of the Cotton Belt extend from Illmo, Mo., to Ft. Worth, Tex., and from Mt. Pleasant, Tex., to Waco, with an important branch line from Addison, Tex., to Dallas, comprising in all 873 miles. On this basis, the normal annual rail requirement should be 43.6 miles.

At the end of Federal control there was an accumulated rail obligation of 319 miles. During the years 1921 and 1922, a total of 181 miles of 75-lb. rail was laid so that, at the time the rehabilitation program was undertaken, the deficit had been reduced to 225 miles. The plan called for the progressive application of 85-lb. rail at a rate that would wipe out this obligation by the end of 1930. No rail was laid during 1924, and it was desired to full-ballast all track upon which new rail had already been laid. This halt in the rail program made it possible to apply a full-ballast section as rapidly as the heavier 85-lb. rail was laid during 1925 and in subsequent years. It is the policy of the management to replace currently the lighter rail on branch lines with rail released from main line tracks. By following this policy, about 200 miles of 75-lb. relayer rail, releasing 56-lb. rail, will be laid during the next five years.

In addition to the rail and joint fastenings, 240,000 anti-creepers and 3,732,000 tie plates were applied to the new rail. Of these two items, only 320,000 of the tie plates were applied in maintenance. The excess expenditures for rail and rail fastenings over the normal requirements during this period have aggregated $1,182,000, or a yearly average of $147,750, so that after 1930 there should be a substantial reduction in this item of operating expense.

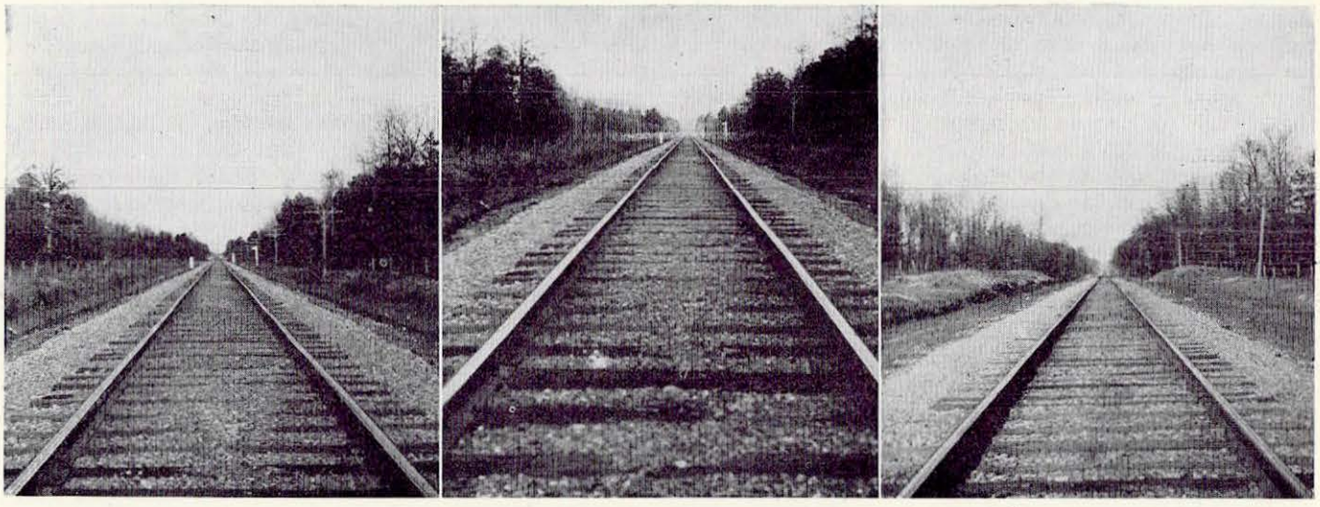
Reduction in Length and Number of Trestles

A large number of drainage and improvement districts have been organized in recent years in the territory served by the Cotton Belt, so that numerous wooden trestles which formerly carried the surface drainage are no longer required. Many of these openings have been filled and abandoned. In other cases it has been found economical to fill short wooden spans, replacing them with concrete boxes or pipe culverts. In still other cases frame trestles have been replaced with permanent spans of steel or concrete. It is the

policy of the company, in pursuance of the rehabilitation plan, to eliminate all open-deck trestles of untreated material. To this end, such timber bridges as are to be retained are being replaced with trestles constructed of creosoted material as they need renewal. At present 230,000 lin. ft. of timber trestles are in service, of which 43,000 lin. ft. are of the treated ballast-deck type. As a result of this policy, the total reduction, since 1922, in the length of timber trestles was 43,115 lin. ft., or 8.17 miles, at the end of 1929. This was accomplished at a total cost of $970,000, and will result in a substantial decrease in the cost of maintaining these structures. There still remains a wooden trestle 15,373 ft. long over the White river at Clarendon, Ark., which is to be replaced with a shorter, permanent-type structure when renewal becomes necessary.

Miscellaneous Maintenance and Betterment

In addition to the major items which have been mentioned, a large amount of miscellaneous work, involving both deferred maintenance and betterments, has been completed and still other projects are in contemplation. These include the installation of track scales, the reconstruction and improvement of station and other buildings, the installation of block signals and interlockings, the installation of floodlighting in yards, and many other items. The improvement made in the water facilities is typical of these miscellaneous improvements. Wooden tanks are being replaced with steel tanks as rapidly as possible. Pumping stations have been rebuilt and modern pumps and machinery are replacing the former obsolete equipment. Facilities for treating water by the lime-soda ash process, or with sodium aluminate, or a combination of these methods, have been installed at all water stations where treatment is required, this work having been completed during 1929.



Rehabilitated Track Laid With 85-lb. Rail On Creosoted Ties and Washed Gravel, and a Well-Drained Roadbed

The Equipment Program

The equipment program had two objectives: (1) The modernizing of the shops, tools and machinery; and (2) the retirement of obsolete wooden cars and the substitution of steel underframe equipment. Substantial progress has been made along these lines. Up to and including 1929, $391,000 had been spent for new shop machinery and tools. As a result, a considerable reduction has already been effected in the cost of maintaining equipment. In 1920, the cost of freight car repairs per freight car mile was 2.90 cents. In 1927 this had decreased to 0.94 cents and in 1929 to 0.79 cents. Likewise the cost of repairs per locomotive per freight train mile dropped from $0.3448 in 1922 to $0.2296 in 1929.

During this period, however, more than 7,000 of the obsolete freight cars, or approximately half of the total number owned in 1920, have been retired and replaced with modern equipment. During the next few years it is planned to retire 39 locomotives, 25 passenger cars, 2,931 additional freight cars, and 157 units of work equipment. At the same time it will be necessary to purchase 15 heavy freight locomotives, 16 passenger cars, 2,360 freight cars and 183 miscellaneous units, at an estimated total cost of $7,550,000.

Ten new locomotives of the 4-8-4 type were placed in fast freight service between Pine Bluff, Ark., and Texas points in 1930. The boilers carry a pressure of 250 lb., the engine and tender weigh 723,000 lb., and the driving wheels are 70 in. in diameter. The locomotives are capable of making a tractive effort of 62,000 lb., which is more than 18 per cent greater than that of the heaviest locomotive heretofore in service on this road. Between East St. Louis and Pine Bluff, one of these locomotives will haul 140 loaded box cars, while they will handle 75 cars west of Pine Bluff.

Fuel oil is plentiful in the territory served by the Cotton Belt and for this reason, as well as because of its greater economy and increased efficiency, it was decided, in 1922, to use this type of fuel exclusively in Texas and to a large extent on the northern section of the road. As a result, storage tanks with a total capacity of 1,230,000 bbl., have been erected and 23 fuel-oil stations for delivery of the oil to locomotives have been established. In 1923, 147 locomotives were converted from coal burners to oil burners, and 31 have been so treated since, at a total cost of $390,000. The total cost of the fuel-oil storage and delivery facilities was $735,000.

Passing Sidings

One of the principal causes of delay to road trains, which reduced the average speed between terminals, was inadequate passing facilities. This lack of proper facilities also, in many instances, reduced the tonnage capacity of the trains. For this reason, the construction of additional sidings at strategic points and the extension of existing sidings, of sufficient length to hold one

maximum freight train and a shorter train, was given a preferred place in the list of improvements which were considered imperative. Since 1922, approximately 41 miles of such sidings and extensions have been constructed, at a total cost of more than $800,000.

As has already been mentioned, the changes which have taken place, and to some extent are still taking place, in the character of the traffic offered to the Cotton Belt, have necessitated a material reduction in train schedules. Under the conditions which existed in 1922, and still exist over certain sections of the road, it was not possible to meet these schedules with the full tonnage that makes an economical train load. Bringing the roadway and track maintenance up to a new standard has enabled these trains to make higher speeds with less damage to both track and equipment, and has thus reduced the cost of these items of operating expenses by substantial but indeterminate amounts. This feature of the rehabilitation work had a definite influence toward better train operation, but it did not have a corresponding effect on the cost of train operation.

Reduction of Grades

The construction of additional and longer passing sidings gave immediate relief with respect to the cost of train operation, in that it eliminated the delays which were caused by lack of these facilities. To a certain extent the reduction in road delays permitted an increase in the average tonnage per train, but this increase was not enough to give an economical train load. Heavy grades over a considerable mileage of the main line still remained to limit the tonnage loading of trains.

Surveys were made during 1925, 1926 and 1927 over the entire main line and the more important branches, to determine the extent to which present ruling grades could be reduced, and an estimate of the cost of this work was prepared. The ruling grades between East St. Louis, Ill., and Illmo, Mo., are 0.3 per cent in both directions, except on the approaches to Thebes bridge across the Mississippi river near Illmo, at which point pusher service is available. Between Illmo and Pine Bluff, Ark., the ruling grade was 0.5 per cent.

During 1927, grades were reduced to a maximum of 0.3 per cent in the freight district between Jonesboro, Ark., and Pine Bluff, 142 miles, at the relatively small cost of $144,000. It was planned to continue this grade reduction to Illmo in 1928, at an estimated cost of $675,000, but owing to the necessity of concentrating on the grade revision work which was in progress on the Texas lines, this work was deferred temporarily. When it is completed, the ruling grades in both directions between East St. Louis and Pine Bluff, 404 miles, will be 0.3 per cent, except on the approaches to the Thebes bridge and, temporarily, at the southbound entrance to the yard at Jonesboro, where pusher service is also available. Plans for a new yard at Jonesboro, also contemplate the reduction of this grade to 0.3 per cent.

The surveys show that a maximum gradient of 0.5 per cent between Pine Bluff and Mt. Pleasant, Tex., 212 miles, is practicable and, while this is not on the list for immediate execution, it is planned to undertake this project when traffic and financial conditions justify the expenditure.

Reconstruction in Texas

That part of the main line between Mt. Pleasant, Tex., and Corsicana, 142 miles, was unballasted and had maximum gradients of 1.8 per cent and curvature up to 10 deg. Exhaustive studies were made to determine the most economical plan for the reduction of these grades, the revision of the alinement and the improvement of the drainage between these points, taking into account the topography of the country and the present and prospective traffic.

Work was begun in 1928 between Mt. Pleasant and Tyler, 67 miles. The plans called for an almost complete relocation of the line at a cost of approximately $2,180,000. Between these points only 2.37 miles of line remained unaltered as to either grade or alinement. This project, which was completed in August, 1929, included the laying of 85-lb. rail, the installation of a full ballast section and an extensive system of roadbed drainage. The curvature was reduced to a maximum of 4 deg., while grades were reduced from a maximum of 1.8 per cent to maximum momentum grades of 1 per cent, so that the same tonnage per train can now be handled through from Pine Bluff to Tyler.

During 1929 the grade and line revision work was extended from Tyler to Corsicana, 75 miles, and was completed in 1930. On the section between Tyler and Corsicana the grades have been reduced to maximum velocity grades of 1 per cent. The curvature has been reduced to a maximum of 4 deg., and the other standards of construction were the same as those between Mt. Pleasant and Tyler. When this work was completed it became possible to increase the tonnage of freight trains from 1,350 tons northbound and 1,450 tons southbound to 1,750 tons in both directions. The cost of the reconstruction between Tyler and Corsicana was $3,150,000.

The reconstruction of these sections of the line made it necessary to build a new yard at Tyler which was completed last year. The yard facilities at Jonesboro are inadequate to permit the expeditious handling of the traffic. For this reason property has been purchased at this point for the purpose of constructing adequate yard and engine terminal facilities. It is expected that this work will be started in the near future.

While many of the improvements contemplated in the plan, as outlined in 1922, have been completed and substantial progress has been made on others, there yet remains much work for the future. The results from the improvements already carried out are gratifying, and it is expected that when the whole program is completed they will be still more impressive. Comparing the operations in 1920 with those of 1929: The average movement of the cars on Cotton Belt rails in 1920 was 30.36 miles per day; in 1929 this had been increased to 44.12 miles. In 1920 the movement of foreign cars was 34.13 miles per day; in 1929 this had been increased to 92.57 miles. At the same time the movement of owned cars increased from 13.81 mi. per day to 15.79 mi. Furthermore, as a result of the grade and line revision between Mt. Pleasant and Tyler, there was an average increase of 109 tons per through freight train in each direction in 1929, as compared with 1928, which resulted in a saving of 29,000 freight train miles.

In 1921 the fuel consumption per 1,000 g.t.m. was 132 lb.; in 1929 it was 107 lb. The factors entering into this conservation were reductions in road delays through the lengthening of the passing sidings, the installations of superheater units, the retirement of obsolete locomotives, with the consequent ability to haul heavier trains.

In 1924 there was one engine failure for every 63,159 miles run. In 1928, this was reduced to one failure for 84,216 miles. Similarly the cost of handling engines at terminals was reduced from $6.58 in 1922 to $4.56 in 1928. Again there was an increase in the gross ton miles per freight train hour from 12,471 in 1920 to 21,581 in 1929. This increase was the result of improved passing facilities, a reduction in the number of slow orders and derailments resulting from improved

drainage and better track conditions, an increase in the average tractive power of locomotives and the installation of 12 boosters.

A New Route from St. Louis to Memphis

Contracts, which were approved by the Interstate Commerce Commission, were made in 1928, which provide the Cotton Belt with a new and shorter route from Malden, Mo., through the St. Francis Basin, to Memphis, Tenn. Under these contracts ownership was secured, through an exchange of stock, of the Gideon & North Island, from Malden to Gideon, nine miles; of the Deering Southwestern, from Caruthersville, Mo., to Hornersville, 30 miles; of the Blytheville, Leachville & Arkansas Southern, from Leachville, Ark., to Rivervale, 19.09 miles; of the Mandalay branch of this road, 3.82 miles; and of the Arkansas Short Line from Truman, Ark., to McDonald, 32 miles

To provide a continuous route from Malden to McDonald, it has been necessary to reconstruct the Gideon & North Island and extend it from Gideon, Mo., to Deering, 27.31 miles; to reconstruct the Deering Southwestern from Deering to Hornersville Jct., 14.44 miles; to use 2.08 miles of the existing line of the St. Louis Southwestern through Hornersville; and to construct 10.41 miles of new line from Hornersville, Mo., to Leachville, Ark. All of this work is completed. In addition, 0.24 miles of St. Louis-San Francisco track is used at Leachville to provide a connection with the Blytheville, Leachville & Arkansas Southern which has been rehabilitated to Caraway, 13.06 miles. From Caraway a new line was constructed to Truman, 15.7 miles, to connect with the Arkansas Short Line which is used to McDonald, 31.28 miles. The Missouri Pacific line is used from McDonald to Memphis.

The cost of reconstructing and extending these lines through the St. Francis Basin approximated $2,700,000. The distance from Malden to McDonald by the new route is 114.5 miles, and from McDonald to Memphis 34.4 miles, a total of 148.9 miles. Compared with the former route, through Brinkely, 210.7 miles, there was a reduction of 61.8 miles.

Railway Earnings In 1930

WASHINGTON, D. C.

CLASS I railroads in 1930 had a net railway operating income of $885,011,324, which was a return of 3.36 per cent on their property investment, according to complete reports for the year compiled by the Bureau of Railway Economics. Their net in 1929 was $1,274,605,403 or 4.95 per cent.

Compared with a reduction in 1930 of 14 per cent under 1929 in the volume of freight traffic carried, there was a decrease of 16 per cent in operating revenues and a decrease of 12.8 per cent in operating expenses. Expenditures for maintenance of way and structures in 1930 amounted to $713,012,582, a decrease of $151,692,048 or 17.5 per cent compared with 1929, while expenditures for maintenance of equipment amounted to $1,027,042,042, which was a decrease of $185,369,877 or 15.3 per cent.

Passenger traffic in 1930 was the smallest for any year since 1906. Passenger revenues in 1930 amounted to $729,635,768, which was a decrease of $144,400,550 or 16.5 per cent compared with 1929.

Operating revenues in 1930 amounted to $5,342,957,047 compared with $6,360,303,776 in 1929, a decrease of 16 per cent. Operating expenses in 1930 totaled $3,975,781,785, compared with $4,560,836,482 in 1929, a decrease of 12.8 per cent.

Class I railroads in 1930 paid $353,685,697 in taxes, a decrease of $49,257,488 or 12.2 per cent under the total tax bill in 1929.

Twenty-one Class I railroads operated at a loss in 1930 of which seven were in the Eastern district, two in the Southern and twelve in the Western.

Net railway operating income by districts in 1930 with the percentage of return based on property investment was as follows:

New England Region	$43,907,264	4.64%
Great Lakes Region	136,601,445	2.83%
Central Eastern Region	184,151,312	3.68%
Pocahontas Region	82,887,791	7.14%
Total Eastern District	447,547,812	3.75%
Total Southern District	89,107,054	2.68%
Northwestern Region	92,907,629	2.55%
Central Western Region	172,719,247	3.47%
Southwestern Region	82,729,582	3.35%
Total Western District	348,356,458	3.14%
United States	$885,011,324	3.36%

For December, 1930, the net railway operating income of the Class I railroads amounted to $49,371,769, which was at the annual rate of return of 2.59 per cent on their property investment. In December, 1929, their net was $71,892,175 or 3.86 per cent. Operating revenues for December amounted to $377,932,812, compared with $469,395,496 in December, 1929, or a decrease of 19.5 per cent. Operating expenses totaled $297,606,152, compared with $363,661,547 in the same month the year before, equivalent to a decrease of 18.2 per cent.

The net railway operating income for the Class I railroads in the Eastern district in 1930 totaled $447,547,812 which was at the rate of return of 3.75 per cent. In 1929, their net was $648,738,188 or 5.57 per cent. Operating revenues in the Eastern district in 1930 totaled $2,660,391,580, a decrease of 16.1 per cent, while operating expenses totaled $1,983,316,352, a decrease of 12.8 per cent.

Class I railroads in the Eastern district for December had a net of $21,970,696, compared with $35,485,417 in December, 1929.

Class I railroads in the Southern district in 1930 had a net of $89,107,054 at the rate of 2.68 per cent. In 1929, their net amounted to $133,115,670, which was a return of 4.05 per cent. Operating revenues in the Southern district in 1930 amounted to $643,369,634, a decrease of 16.4 per cent, while operating expenses totaled $503,865,540, a decrease of 13.1 per cent. The net in the Southern district in December amounted to $9,006,844, while in the same month in 1929 it was $10,914,183.

Class I railroads in the Western district in 1930 had a net of $348,356,458, a return of 3.14 per cent. In 1929, they had a net of $492,751,545, or a return of 4.55 per cent. Operating revenues in the Western district in 1930 amounted to $2,039,195,833, a decrease of 15.7 per cent, while operating expenses totaled $1,488,599,893, a decrease of 12.7 per cent. For December, the net of the Class I railroads in the Western district amounted to $18,394,229. The net railway operating income of the same roads in December, 1929, totaled $25,492,575.

Class I Railroads—United States

	1930	1929
Month of December		
Total operating revenues	$377,932,812	$469,395,496
Total operating expenses	297,606,152	363,661,547
Taxes	20,423,776	24,323,484
Net railway operating income	49,371,769	71,892,175
Operating ratio—per cent	78.75	77.47
Rate of return on property investment	2.59%	3.86%
Twelve months ended December 31		
Total operating revenues	$5,342,957,047	$6,360,303,776
Total operating expenses	3,975,781,785	4,560,836,482
Taxes	353,685,697	402,943,185
Net railway operating income	885,011,324	1,274,605,403
Operating ratio—per cent	74.41	71.71
Rate of return on property investment	3.36%	4.95%

Tentative Recapture Report on Norfolk & Western

WASHINGTON, D. C.

THE Interstate Commerce Commission on February 13 made public its first tentative recapture report involving one of the larger railroad systems, directing the Norfolk & Western to pay to the commission, unless it files a protest by March 25, the sum of $15,849,344 as one-half of its net railway operating income in excess of 6 per cent on its value as computed by the commission's Division 1, for the years 1924, 1925 and 1926. While the report does not say so the figures used indicate that these computations were made on the basis of the alleged "formula" for complying with the decisions of the Supreme Court that some weight must be given to current costs of reproduction, which seemingly has been used in numerous tentative or proposed recapture reports issued in recent months.

By this "formula" the effect of the weight given to cost of reproduction is diluted by averaging it with an estimated original cost, less depreciation. Most of the reports issued so far have involved the smaller roads, although they include one Class I road, the Richmond, Fredericksburg & Potomac. As the report represents the tentative findings of Division 1, and has not yet been passed upon by the commission, the order appended, following the practice for these tentative reports, includes a proviso that the filing of a protest by the date set, if the carrier disagrees with the determination of its value and net, shall stay the application of the order pending the hearing and determination of such protest. Unless the protest is filed the tentative report and order will be considered a final determination of the matter.

An examination of the data indicated, the report states, that no recapturable income was earned by the Norfolk & Western in the four months ended December 31, 1920, or in the calendar year 1921. Accordingly this report only includes findings as to recapturable income for the years 1922 to 1926, inclusive, but no excess above 6 per cent was found for 1922 or 1923. For 1924 the report finds an excess of $2,582,400, for 1925 an excess of $10,312,101, and for 1926 an excess of $18,804,186. The sum of half these amounts is $15,849,344.

The report is based on findings of value ranging from $323,000,000 for 1922 to $379,500,000 for 1926, whereas the Norfolk & Western in its returns to recapture orders had stated its valuation as ranging from $347,374,243 for 1920 to $741,961,802 for 1926, and on this basis reported no net in excess of 6 per cent. The commission's final valuation report as of 1916 had found the value for rate-making purposes to be $236,317,954. Subsequently the N. & W. acquired other roads whose properties the commission has valued at $4,058,589 and the commission finds the net increase by reason of additions and betterments to have been $121,217,566. Adjustments are made to reflect the length of time the additional property was in service.

Although the commission had reported that the original cost of all the property as of the primary valuation date could not be ascertained, an estimate was made, partly on the basis of cost of reproduction at the 1910-1914 level of prices, and the original cost of the operated property as of June 30, 1916, was placed at $264,323,640. After taking into account the net costs of property added and retired to December 31, 1921, the original cost at the beginning of the recapture period was found to be $309,930,148, exclusive of land, and for the year ended December 31, 1925, original cost is stated as $361,153,132, while cost of lands was placed at $11,968,587.

The report also shows the book investment for each year, $386,666,946 on December 31, 1925, and the cost of reproduction figures, which for the year ended December 31, 1925, were $502,688,100 for the cost of reproduction new and $388,985,217 for the cost of reproduction less depreciation. It is stated that these were determined "by a consideration of prices current during a period of years, including the recapture years." The value of lands was placed at $36,594,864 on December 31, 1925, and the amount of working capital including material and supplies used during 1926 was stated as $10,865,000. Then follows a statement of the outstanding capitalization, which was $280,757,402 on December 31, 1927, after which the conclusions as to value are given, without any statement as to how they were reached, although it is stated that the supporting records underlying the determination of value are on file in the commission's office and are open to the carrier's inspection.

Several railroads, in their protests against tentative recapture reports previously issued have asserted that the final values found are "apparently the product of a pre-conceived mathematical formula," to which objection has been made on the ground that it gives only 50 per cent weight to costs of reproduction and especially because of the deduction of a depreciation allowance from the original cost estimates, particularly since the commission's accounting system does not provide for depreciation in all accounts. In many of the tentative reports the original cost estimates have been set up in parallel columns with original cost depreciated, and the Bureau of Valuation in one of its briefs said that original cost figures for property other than land "have been reduced in the same ratio that the cost of reproduction less depreciation bears to the cost of reproduction new for such property, as reported by the engineering section of the bureau."

In the Norfolk & Western report no mention is made of depreciation as applied to the original cost findings but apparently the deduction was made just the same before the final value figure was arrived at. The cost of reproduction less depreciation as stated is about 23 per cent less than the cost of reproduction new and if the average of the cost of reproduction and the original cost is reduced in this proportion the result checks very closely with the formula which various railroads think they have perceived, when value of land and working capital are added to this depreciated average. And this $379,500,000 final value is about $4,000,000 less than the original cost, including land, $373,121,719, plus $10,865,000 for working capital, although it is more than would have been obtained by the O'Fallon method, which would produce a total of something like $325,000,000 at the end of 1925—the estimated original cost of 361 millions, less 78 millions for depreciation, plus present value of lands and working capital. Also there are indications that deductions for depreciation were made in making the original cost estimate.

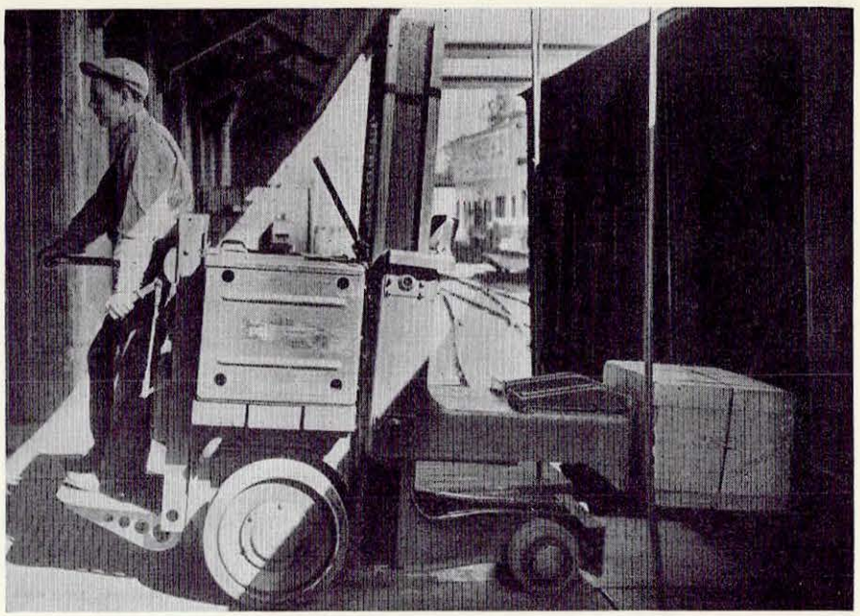
The net railway operating income, after some adjustments, was found to range from $18,339,021 in 1922 to $41,574,186 in 1926. Six per cent on the valuation for 1926 would be $22,770,000.

FRED LAVIS, president of the International Railways of Central America, has been designated chairman of the Pan American Railway Committee by the governing board of the Pan American Union. Mr. Lavis will fill the vacancy caused by the death of Charles M. Pepper.

Skids Prove Their Worth

New York Central and other roads find them valuable

By Albert West Shaffer,
Marine Assistant,
New York Central



Handling Tin-Plate in 2,000-Lb. Units with a Power Lift Truck Designed for Skid Operations

SINCE the adoption of the skid method of transferring freight at the Port of New York, the New York Central has saved approximately 25 per cent in handling costs and has practically eliminated damage on commodities which formerly produced numerous claims. These results are based on 63,152 skid shipments made to steamer-side, representing 95,000 tons of freight, or an average of 1.5 tons per skid load. This includes freight of all descriptions which has lent itself readily to this method of transportation.

The skids used by the N.Y.C. are what are termed "steel-bound" skids, and are so constructed as to warrant their continued use. We are operating approximately 4,000 skids and for handling them we have 18 power trucks and 25 hand trucks. While the skids are fundamentally the same in design and general dimensions as others supplied by the manufacturers, they also incorporate certain features designed by the material handling committee of the New York Central, and represent the result of an exhaustive test of this type of equipment.

Generally, the freight is loaded on skids from the cars and, after being unloaded at ship's side, the skids are returned light, or loaded with freight picked up at steamship piers in New York harbor, for westbound movement over the N.Y.C.

There is also a considerable movement of "one-way" skids, which move from origin to destination with the shipment. Practically all such skids are supplied by the shippers. These are ordinarily returned light, although a considerable two-way loaded movement of skids has been developed between the N.Y.C. and the coastwise steamship lines. Among the principal products shipped on the "one-way" skids are paper, tin plate, and certain types of machinery.

Advantages of Skids

The use of skids was formerly confined largely to industrial plants. However, in freight stations, the demands for heavier loads to be moved greater distances at a higher rate of speed has brought power-lift trucks into use. Their designs range from low lift to high lift, chisel trucks, stacking trucks and, in fact, trucks to meet all requirements for the safe and economical handling of any size skid or package. By power truck operation it is possible to move loaded skids weighing from four to five tons at a speed of from 400 to 500 ft. per min., as compared to the old method of man power push trucks moving approximately 500 to 600 lb. at a rate not to exceed 100 ft. per min.

As the skid platforms acquired mobility, many new and valuable uses were found for them. The skid platform, although varied in design, is simple to build and requires little or no repairs. It can be used to carry all kinds of objects that can be conveniently piled upon it, with the result that its use has spread until there are several million in use in manufacturing plants, warehouses and in the railroad and steamship movement of freight, and the saving in the handling of material by this method, eliminating individual handling of small units, soon pays for the initial cost of the skid.

At first skids were used exclusively in individual manufacturing plants, their dimensions varying to best suit the individual users, no thought being given to the interchangeability of skids between plants, or for transit movement. With the movement of skids from one plant to another, either by water, rail or motor truck, the question of dimensions became somewhat of a problem. For example, an individual plant located in the Midwest would use a skid 40 by 60 in., with a 5 or 6 in. under clearance and lift trucks of a corresponding height, while some other plant to which this skid might be shipped would be equipped to handle skids of 12 in. under clearance, necessitating either the jacking up of the skid proper in order that their lift truck equipment might handle it, or in many cases the rehandling of the materjal onto skids of the dimension adopted by the second plant.

The problem took such proportions as to warrant serious consideration on the part of the Bureau of Simplified Practice of the Department of Commerce and on June 28, 1928, a committee of shippers and manufacturers met at Washington, D. C., and, with a view of standardization, tentatively established definite standards, at first giving thought to clearance dimensions and adopting clear heights from bottom of runners or legs to underside of the platform of 8 and 12 in., with a minimum horizontal distance between inside of runners or supports of 29 in. These dimensions were decided upon as

they represented the height of the majority of hand and power lift trucks in use throughout the country.

So long as the platform remains within the accepted height and over-all width dimensions, the length may vary governed by local conditions. However, the diversity in size of the platform generally used will not present a serious handicap to the future growth of the profitable practice of handling goods on skid platforms, as the general dimensions accepted will allow interchangeability.

It is found that the cost of loading and unloading freight frequently exceeds the freight charges, and whereas railroads and steamship companies have made great strides within the past few years in equipment, little or no thought has been given to a change in the method of loading or unloading, until the adoption of the skid platform, which affords the most practical method introduced to date for the reduction of unit handling.

From two to five handlings of merchandise are saved by the use of the skid platform method. The number of units is also reduced. Take for example a carload of canned goods consisting of 1,000 cases loaded in a car in the customary manner. Each case is handled individually, and upon arrival at the pier stations in New York or any other break-point, each case must again be individually picked up. Each time it is again necessary to move the shipment, 1,000 units must be moved, whereas if this shipment had arrived on skids, a carload of cased canned goods would have been moved as 13 units, each containing approximately 77 cases, as is the practice of the N.Y.C. in the movement of canned goods and like commodities between its rail terminal and steamer side or to destination on the West Coast at such times as the skid platforms are stored aboard the steamer.

Saving in Claims

In addition to the saving in the number of units handled, speed of handling and convenience of load, there has been a noticeable falling off in the number of damage and pilferage claims to goods moved by the skid platform method.

It has often been said that low rate commodities would not lend themselves to this method of transportation; yet one of our foremost steamship companies undertook an experimental movement of a commodity formerly showing as high as 30 per cent breakage, moved it from freight cars, supplied one way skids, strapping, etc., and landed it at its destination at a decrease of some 40 per cent in handling cost, eliminating breakage entirely. Needless to say this method was immediately adopted for future shipments.

We had experienced a similar percentage of breakage on an equally fragile commodity when handled by the old method, and when handled by the skid method were able to clear the freight through the Port of New York, and with the aid of the steamship company, land it on the job at Miami, Fla., without any breakage. In addition to a saving of some 20 per cent in handling cost, we reduced the time of our lighter at ship side from 48 to 4 hours, thereby effecting an additional saving. Bag goods, cased goods, machine parts, valves, and other outthreaded parts subject to damage, are now being handled expeditiously and economically by means of this method.

The savings in claims amount to from 25 to 50 per cent of the original operating cost, due to the elimination of the handling of individual cases and the speed and ease with which the unit skid loads are handled between the canneries and the consignee's warehouse.

After the adoption of the skid platform by a large shipper, it developed that, under the old method his product was boxed in lots of 500 lb. This manufacturer is now shipping 90 per cent of his output on skids, containing from 3,000 to 5,000 lb. per skid, at a saving in boxing cost of 83⅓ per cent on 3,000 lb., and 90 per cent on 5,000 lb. of product shipped.

Specific Skid Operations

A transportation company of San Francisco, acting as a pioneer in this method of transportation on the West Coast, is now executing a contract to deliver the product of the California Packing Corporation from the Sacramento Valley canneries to the docks in San Francisco and is fast developing a business to insure the return loaded movement of the skid.

The skids are loaded in the packer's plant, eliminating individual case handling at the steamship terminals, including movement from the warehouse by truck to boat, thence to port of call, and from boat by truck to consignee's warehouse as a unit package containing some 75 cases in each instance.

Under the old method it required approximately three days to discharge a cargo of 13,000 cases of canned goods, whereas, when handled by the skid method, the same number of cases were handled in approximately four hours. In short hauls the hand lift truck is used; when the haul or volume increases power driven lift trucks are used.

The following results were obtained by the stores department of a middle western railway:

The movement of brass castings when handled by the man-pushed hand truck, required three hours to unload 10,690 lb. of brass from an auto truck and place it in stock. In the movement, the brass was taken from the hand truck, weighed, piled back on the truck, and moved to the point where it was to be unloaded and placed in stock, the material being moved a distance of 50 ft., the average load being approximately 180 lb. By the application of the skid platform method to the movement of this commodity, the same weight of material was moved from the auto truck, weighed and placed in stock in six minutes. In comparison, one man with a power lift truck can accomplish in one hour what one man with a two-wheel hand truck can accomplish in 30 hrs.

Mixed scrap collected at the scrap dock by the old method, necessitated hand loading in gondolas and shipping to a central point where it was unloaded and sorted. When handled by the lift truck and skid method, the scrap is sorted on skids and, on arrival at the central point, emptied by use of a crane, effecting a saving in labor cost of 60 per cent. In continuous operation it has been found that one man with a power lift truck and skids can perform in one hour what it formerly required four men 12 hrs. to perform by hand, or one man hour as compared to 48 man hours.

In the handling of bagged goods, such as soda ash, weighing 150 lb. per bag, by the old method of man-powered push trucks, one bag was handled at a time. This included the loading on the truck, moving approximately 100 ft. and unloading in piles and required one man one hour to unload and stow 14 bags. In a like manner, soda ash and like commodities have to be picked up from the pile, placed on the two-wheel truck and trucked into the car when shipping to outside points, and the same operation repeated at destination. Skids and hand-lift trucks are now used for unloading and storing soda ash, 12 sacks or 1,800 lb. per skid load, two men unloading 36 sacks per man hour. The soda ash is left in the storage shed on skids and in a like manner loaded for shipment to outside skids until used. The hand truck

(*Continued on page 416*)

D. & H. Handles Four Ends of Double Track by Centralized Control

Installation solves operating problem on two short sections of single track and permits closing of four offices

Southbound Home Signal at X—Note Metal Instrument House at Left

THE Delaware & Hudson has recently installed centralized traffic control on 12.5 miles of line between Center Village, N. Y., and Lanesboro, Pa. This equipment facilitates train movements on two short sections of single track and permits the closing of four offices formerly required at the four ends of double track in this territory.

The Operating Problem

This section of line is a portion of the Pennsylvania division, almost all of which is double track. It extends for 12.5 miles from the end of double track on the north to the end of double track on the south. Within this territory, a section of second track was constructed years ago as a means of increasing the track capacity on a grade which ascends for 5.7 miles at a rate varying from 0.24 to 0.38 per cent. This left a section of single track 3.6 miles long at the south end, and another 3.1 miles long on the north, both on a rolling grade. The locations of these four ends of double track are designated on the diagram by the telegraph call letters for the offices formerly located at these points.

A No. 10 crossover had been provided at a point designated as North End, which is near the center of the double-track section, with the idea that fast freight trains could be run around slower trains between that point and X. However, as the switches were hand-thrown with no attendant on duty, such a movement introduced so much delay on account of stopping the train on a heavy grade, that the arrangement was seldom used.

Operators were on duty for three tricks at the ends of double track at DV, X, RA and KY, and at each of these points the switches were operated by a two-lever mechanical interlocking machine with hand switches to control the signals. Tower indicators were provided to indicate the approach of trains on double track, as well as to show when the single track was occupied. Telephone and telegraph communication was provided between the several operators, the train movements in this territory being handled over the single-track sections by a form of manual block, without written train orders. Movements against the current of traffic on the double track between X and RA were handled by train orders, which further added to the difficulties of making such movements. Automatic block signal protection was afforded by three-position upper-quadrant normal-danger semaphore signals. The traffic on this territory includes approximately 15 tonnage freight and 2 passenger trains each way, or a total of 34 trains daily.

Solution of Difficulties

Consideration had been given to the idea of controlling the switch at KY from the office at RA, and the switch at DV from the office at X. However, it was decided that the installation of centralized traffic control would reduce the train delays satisfactorily, increase the safety of operation, and, in addition, reduce operating expenses by concentrating the control in one office at Windsor. Under this new system all train movements between DV and KY are now directed by signal indication without written train orders, trains being operated in either direction on both tracks between X and RA. The No. 10 crossover at North End was replaced by a No. 20 in order to permit crossover movements at higher speeds.

The centralized traffic control machine is located in the Windsor station, which is about midway between the two ends of the territory. The control of all the switch machines, as well as the signals which direct train movements over the entire territory, is handled over only three wires which extend from the Windsor station north to DV and south to KY. This installation is the first to be placed in service on which the General Railway Signal Company three-wire system has been used. Likewise, the control machine, on which small knobs similar to those on a radio set are used as levers, is the first of this type to be placed in service. Another important feature is the fact that the illuminated track diagram at the top of the control board gives a continuous indication of the location of all trains in the territory.

Under the illuminated track diagram, a row of signal levers extends across the machine, with a row of switch levers at the bottom, the signal and the switch levers for each switch layout being in a vertical row under the re-

Control Machine with Cabinet Relays in Background

spective switch on the diagram. The levers or knobs may be turned 90 deg. in either direction. A switch lever is turned to the right to reverse the switch and to the left to move it to the normal position, the position of the switch, after the operation is complete and locked, being indicated by a small lighted letter, either N or R, just above the switch lever. The normal position of a signal lever is on center with the indicating arrow point up, and a lever is turned to the right or left to control the corresponding signal. Small lights above each signal lever repeat the position of the signal to show when it is indicating Stop or Proceed.

The control is so arranged that after a train passes a signal and it assumes the Stop position automatically, it will not again display the Proceed indication without the operator again operating the signal lever. The control of the switches is so arranged that the signal lever must be in the normal position and the signal at Stop before a switch will operate. The system can be arranged for much quicker operation, but, with the traffic handled in this territory, faster speed was not required, and it was desired to operate the signals and switches in the same manner as that used at interlocking plants on this road.

A train graph was not considered to be necessary on this installation. However, the operator has a train sheet on which he records the time that trains pass each control point, while he reports to the dispatcher the arrival and departure of trains at DV and KY only. A special telephone circuit extends throughout the centralized traffic control territory, with telephones in the Windsor office and in the sheet metal houses near each power switch. This equipment is used by the trainmen and the maintainer in communicating with the operator at Windsor. An additional telephone circuit extends from Windsor northward to the next interlocking and southward to the next station, this line being used by the operator to secure information as to the approach of trains. In addition, the operator at Windsor is in constant communication by telegraph with the dispatcher at Carbondale, Pa., 56 miles away.

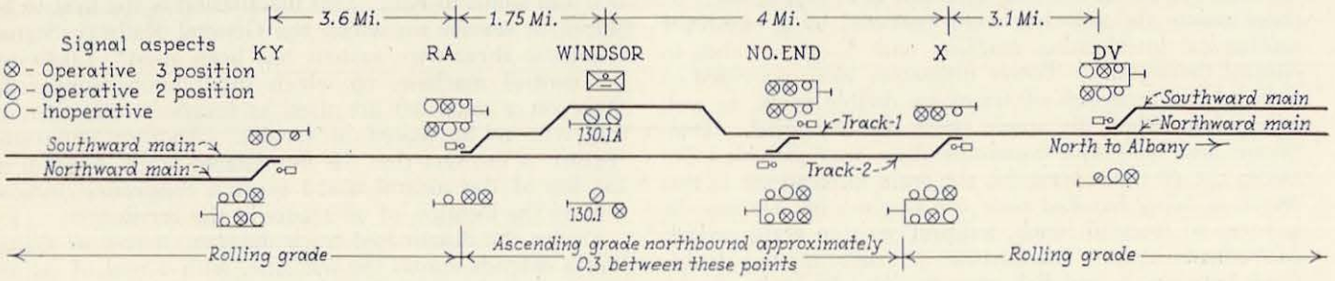
Outside Construction

The signals are the SA type commonly known as the searchlight style. Three units are used for each home-controlled signal so that the aspect will conform with the D.&H. standard for absolute interlocked home signals. The automatic block semaphore-type signals previously in service in this territory were re-arranged to afford intermediate automatic signals as a part of the new system and are controlled by A.P.B. circuits, but in order to simplify this explanation they are not shown on the accompanying track and signal plan. The power switch machines are equipped to operate in about 11 sec., and are provided with dual-control selectors to permit manual operation when necessary. At each field station, i.e., at DV, X, North End, RA, and KY, the control equipment, batteries, etc., are all housed in a house constructed of sheet metal with welded seams. Each of these houses has a small compartment, cut off by a partition, in which the telephone is located, and in which is mounted a complete set of instructions for trainmen as to the operation of a dual-control switch.

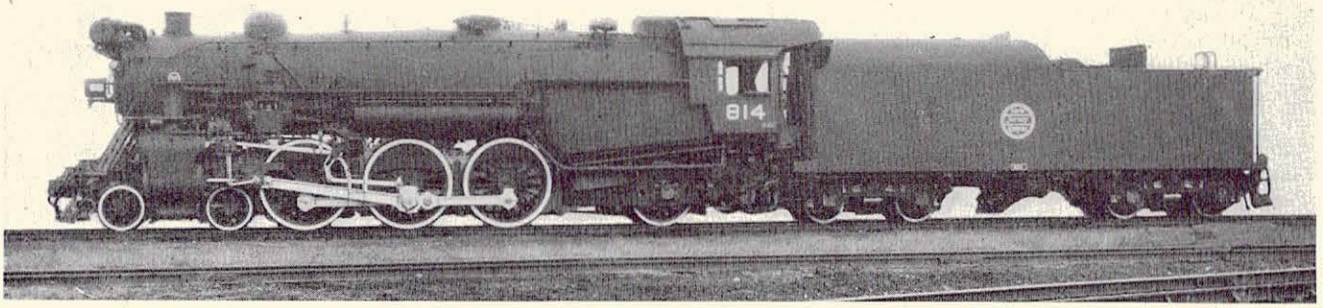
Commercial supplies of alternating current were available at all the power switch layouts by running leads on the company pole line for short distances. The power supply for the operation of the light signals, switch machines, and control circuit is taken from Exide storage batteries, which are charged on the a-c. floating system.

The centralized traffic control was placed in service on October 11, and has given satisfactory service during the winter weather. Train movements have been expedited and numerous stops have been eliminated. Operating expenses have been reduced by the elimination of nine telegraph operators, and the cost of maintaining four small interlockings and four small tower buildings, together with the necessity of supplies and fuel for these buildings.

All the major items of equipment for this new installation were furnished by the General Railway Signal Company, and the construction was handled by the Delaware & Hudson signal forces under the direction of A. H. Rice, signal engineer, to whom we are indebted for the information in this article.



Track and Signal Plan of Centralized Traffic Control Territory, from KY to DV



Pacific Type Locomotive Built for the Central Railroad of New Jersey by the Baldwin Locomotive Works

Pacific 4-6-2 Types on the New Jersey Central

Used for handling heavy suburban and fast passenger trains such as the "Bullet" and "Blue Comet"

DURING the month of October, 1930, five Pacific 4-6-2 type locomotives were delivered to the Central of New Jersey by the Baldwin Locomotive Works. These locomotives have considerably greater tractive force than any Pacific type heretofore used on this road. They bear the road numbers 810 to 814, inclusive, and are a modification of previous 4-6-2 designs developed to meet special operating needs.

With the object of obtaining a locomotive especially suited for handling heavy suburban trains at reasonable speeds and also certain through trains such as the "Williamsporter" and Philadelphia, Pa., and Scranton expresses on the Lehigh and Susquehanna division where heavier grades are encountered and close clearance restrictions are imposed, a driving wheel 74 in. in diameter was adopted. All previous Pacifics on this road have had 79 in. drivers. The new locomotives have 26-in. by 28-in. cylinders, the same as their predecessors, but the boiler pressure has been increased to 240 lb. per sq. in. instead of 230 lb. which was used on the preceding order of Pacifics, described in the March 3, 1928, issue of the *Railway Age*. The earlier locomotives bearing road numbers 831 to 835, haul the "Blue Comet" trains between Jersey City, N. J., and Atlantic City, and the "Bullet" fast express between Jersey City and Wilkes-Barre, Pa. With these changes the maximum tractive force has been raised to 52,180 lb. compared with 46,841 lb. The weight on the drivers has been increased from 197,660 lb. to 205,900 lb. and the total weight of the engine from 326,470 lb. to 333,830 lb.

In order that these locomotives might be used on the New York and Williamsport, Pa., express trains operating through the Lansford tunnel on the Nesquehoning branch, between Mauch Chunk, Pa., and Tamaqua, it was necessary to restrict the locomotives to the tunnel clearance limits imposed at this point. The overall height from the top of the rail to the top of the stack was therefore reduced from 15 ft. 5/8 in. as on previous engines to 14 ft. 9 7/8 in., while the center line of the boiler is 2 1/2 in. lower, measuring 9 ft. 10 1/2 in. from the top of the rail.

The capacity of the tenders for the new Pacific type has also been increased to 13,100 gal. of water, compared with 10,000 gal. for their predecessors but the coal capacity of 15 tons remains the same. This change necessitated increasing the length of the tender wheel base from 23 ft. 10 1/2 in. to 29 ft. 4 1/2 in. As on the previous order, the water-bottom type of tender frame is used with the side sheets welded to the frame making a smooth finished surface and an attractive appearing tender. The tenders are equipped with water scoops as on the previous 4-6-2 type locomotives.

Details of Boiler

Some modifications have also been made in the design of the boilers of the new locomotives. A larger Type A superheater is employed having 45 instead of 36 units, while the number of 2-in. tubes has been reduced from 251 to 207. The superheating surface is 1,000 instead of 791 sq. ft. The length over the tube sheets has been reduced from 19 ft. to 18 ft. 8 in. The grate area remains the same as before, 84.3 sq. ft.

The driving wheel base of the new Pacifics is the same as on earlier order, viz; 13 ft. 10 in. The size of the driving wheels can be increased in the future from 74 in. to 79 in. without great difficulty or expense if desired. The total wheel base is 36 ft. 9 in., which is 1 in. longer than the previous engines, owing to the application of an engine truck having a 7-ft. wheel base instead of 6 ft. 10 in. Alemite grease lubrication fittings are used in the driving boxes for shoe and

wedge fits and hub bearings, and also on the spring rigging.

Among the features of special interest is the placing of all piping as much as possible under the jacket, which enhances the appearance of these locomotives. Extra heavy copper piping was used for pipe lines, such as air lines to the sanders, bell ringer, etc. The pipes to the feedwater heater have also been concealed in the smokebox as will be noted from the illustration of the locomotive, using a special arrangement of piping with case-steel elbows where the feedwater piping enters and leaves the smokebox. Changes in the ports and steam lap together with the use of a 45-unit superheater, has shown a saving of six per cent in fuel consumption. The new power is equipped with an Elesco feedwater heater, modified type B stoker and an Alco power reverse gear.

Comparison of the Principal Dimensions and Weights of Two New Jersey Central 4-6-2 Type Locomotives

Railroad	Central Railroad of New Jersey	
Builder	Baldwin Locomotive Works	
Class	G-4S	G-3S
Road Nos.	810 to 814	831 to 835
Type	4-6-2	4-6-2
Service	Passenger	Passenger
Max. tractive force	52,180 lb.	46,841 lb.
Weight on drivers ÷ max. tractive force	3.94	4.21
Cylinders, diameter and stroke	26 in. by 28 in.	26 in. by 28 in.
Valve gear, type	Walschaert	Walschaert
Weights, in working order:		
On drivers	205,900 lbs.	197,660 lb.
On front truck	63,830 lb.	65,850 lb.
On trailing truck	64,100 lb.	62,960 lb.
Total engine	333,830 lb.	326,470 lb.
Total tender	253,900 lb.	217,000 lb.
Total engine and tender	587,730 lb.	543,470 lb.
Wheel bases:		
Driving	13 ft. 10 in.	13 ft. 10 in.
Total engine	36 ft. 9 in.	36 ft. 8 in.
Total engine and tender	78 ft. 0⅛ in.	72 ft. 2 in.
Wheels, diameter:		
Driving	74 in.	79 in.
Front truck	36 in.	36 in.
Trailing truck	55 in.	55 in.
Boiler:		
Steam pressure	240 lb.	230 lb.
Fuel, kind	Bit. Coal	Bit. Coal
Dia. first ring, outside	78 in.	78 in.
Firebox, length and width	126⅛ in by 96¼ in.	126⅛ in. by 96¼ in.
Flues, number and diameter	207—2 in.	251—2 in.
Tubes, number and diameter	45—5¾ in.	36—5¾ in.
Length over tube sheets	18 ft. 8 in.	19 ft.
Grate area	84.3 sq. ft.	84.3 sq. ft.
Heating surfaces:		
Firebox	228 sq. ft.	228 sq. ft.
Combustion chamber	64 sq. ft.	64 sq. ft.
Arch tubes and syphons	109 sq. ft.	113 sq. ft.
Flues and tubes	3,190 sq.ft.	3,444 sq. ft.
Total evaporative	3,591 sq. ft.	3,849 sq. ft.
Superheating	1,000 sq. ft.	791 sq. ft.
Combined evaporative and superheating	4,591 sq. ft.	4,640 sq. ft.
Tender:		
Water capacity	13,100 gal.	10,000 gal.
Fuel capacity	15 tons	15 tons

Aside from the changes noted, the general design of the new Pacific type locomotive follows closely along the lines of their predecessors. The New Jersey Central emblem, attractively striped in gold leaf appears on each side of the tenders. The locomotive and tender are painted in Nile green.

The design of these locomotives was prepared under the supervision of the mechanical department of the railroad.

WALTER L. SCHMIDT, an engineman, and Clarence W. Piper, a brakeman on the Litchfield & Madison have been awarded gold medals by Harley L. Clarke, Chairman of the Board, for courage and presence of mind shown in saving the life of a nine-year old girl at Worden, Ill., in February, 1930. As their locomotive rounded a curve, the men saw the girl playing on the tracks and after setting the emergency brakes, climbed along the side of the locomotive to the head-end with the intention of snatching the child before she was struck. The locomotive stopped within a foot of the child.

I. C. C. Investigation of All Transportation Proposed

WASHINGTON, D. C.

OPPORTUNITY for the Interstate Commerce Commission to recommend to Congress whether the various agencies of transportation by motor vehicle, waterway, pipe-line and airplane should be regulated, or further regulated, by the government, or whether the "existing governmental regulation of interstate commerce," which mostly applies to railroads, should be modified or amended, would be afforded by the passage of a joint resolution introduced in Congress on February 11 by Senator Fess, of Ohio, and by Representative Parker, of New York, chairman of the House committee on interstate and foreign commerce.

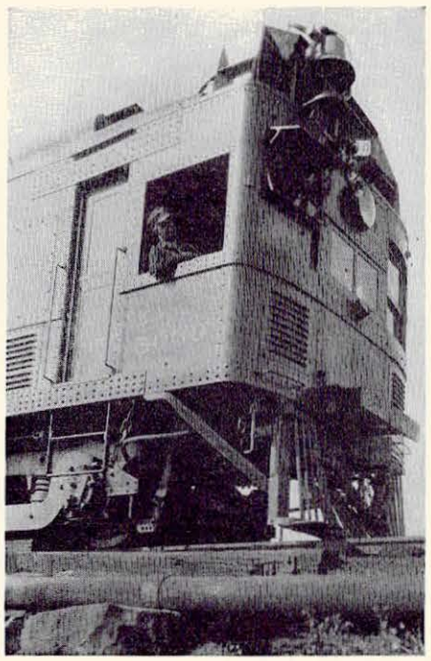
The resolution would direct the commission to conduct an investigation and study of transportation as carried on by these several agencies "to inquire whether, in the public interest, any of them, engaged in interstate commerce, should be regulated, or further regulated, whether existing governmental regulation of interstate commerce should be modified or amended," and to submit a report to Congress in December, 1931, containing its recommendations thereon, together with a finding as to the effect of motor, water, air, pipe-line transportation on railroad revenues and with drafts of appropriate bills to carry into effect such recommendations as it may make in the premises.

A preamble to the resolution refers to the nation-wide study of transportation by motor vehicles on the highways in relation to and in competition with transportation by steam railroads on which the commission has been engaged since May 15, 1930, and states that there are "other forms of transportation agencies in like relation to and in competition with steam railroads, with motor vehicles on the highways and with each other, such as pipe lines, waterways and airplanes" and that "the problem of transportation, as it affects the public interest, is, because of changed conditions created by these agencies, presenting new aspects of substantial importance to the public."

This resolution, which was introduced at the request of the railroads, and represents a part of their campaign for an "equalization" of the regulation of competing forms of transportation, would require the commission to conduct the investigation with more speed than it usually shows in such matters. The present investigation into the matter of co-ordination of highway transport has now been under way for eight months and the final hearing is scheduled for early next month, after which time will be required for the formulation of a report and for argument to bring the matter to the attention of the commissioners. The investigation now proposed takes in three other forms of transportation, and although the latter do not involve so many agencies nor so many details they would bring in another set of conflicting interests.

The railroads' recently announced program has aroused a good deal of criticism because it did not begin with a request for relief for the railroads from some of the regulation which restricts them. The recommendations which this resolution calls for from the commission may serve to put it on record as to whether it would be willing to relieve the railroads of some of the multifarious forms of regulation devised at a time when the railroads were generally regarded as having

(Continued on page 419)



Erie Rail Car Equipped with Two 300-hp. Engines

Marks the first installation of a double power plant—Car to be used in main-line service between Youngstown, Ohio, and Dayton, Ohio

By E. H. Peters* and I. R. Cummings†

THE Erie recently placed in service between Youngstown, Ohio, and Dayton, a double power plant oil-electric car. The car is maintaining a schedule of 30 miles an hour between these stations hauling two trailers and making frequent stops. It represents the first application of two 300-hp. oil engines to a rail car in main-line service.

The oil engines as well as the electrical equipment were manufactured by the Westinghouse Electric & Manufacturing Company, who also installed this equipment in the car body built by the St. Louis Car Company. The car is a combination mail and baggage type with a vestibule at the rear. The principal weights, dimensions and operating data of the car are given in the table.

Engines and Auxiliaries

The oil engines are four-stroke cycle, solid injection type, each rated at 300 hp. at 800 r.p.m. They are arranged side by side in the engine room with the generator forward on the left-hand unit and at the rear on the right-hand unit. This arrangement places the hot exhaust pipes on the outside and leaves a safe center aisle of maximum width.

The engines are cooled by pumping the jacket water and lubricating oil through radiators which are located on the roof. Part of these radiators are force cooled by means of an electrically driven blower under the direct control of the operator. Tanks and a water bypass valve permit circulating all of the cooling water within the cab until it reaches a temperature that will prevent freezing of the radiators when they are brought into use in extremely cold weather.

The fuel tanks are located under the car and lagged to prevent congealing of the oil in normal operation. Oil is raised from these tanks of 600 gal. capacity to the engine by electrically driven pumps. Each engine is also supplied with a centrifugal lubricating-oil clarifier as well as strainers for both the fuel and lubricating oil.

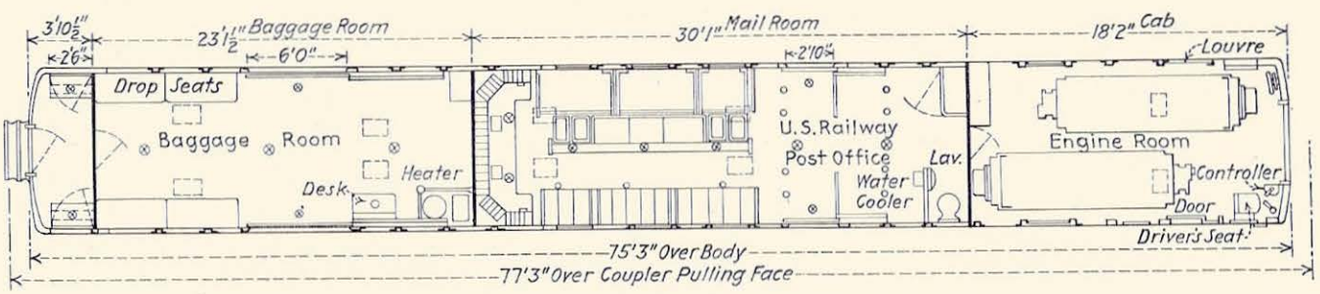
Electrical Equipment

The electrical equipment for each engine consists of a main generator, an auxiliary generator and two traction motors. The power plants may be operated independently in order to obtain a certain degree of flexibility in operation. Each pair of traction motors is arranged to be operated in series, parallel or with shunted field.

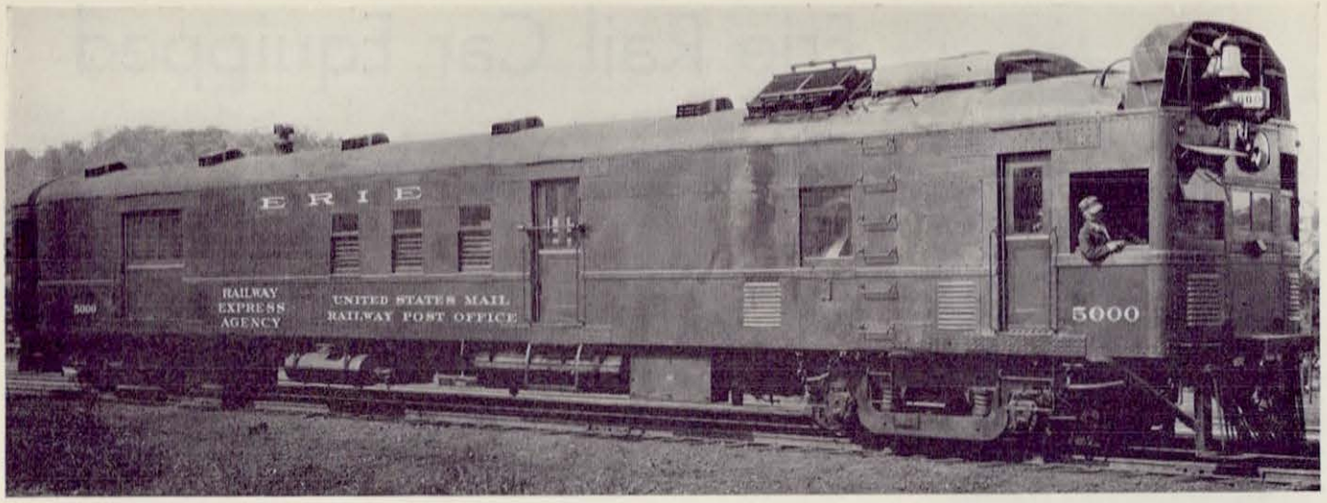
Automatic loading of the engine is provided by the Westinghouse torque control, which limits the load on the engine to that which it can safely deliver at the various operating speeds. All power circuits and the engine speed are controlled remotely, which allows considerable flexibility in mounting the apparatus. It permitted the reverser, the unit switches for series-parallel connection and the contactors for field shunting, as well as the shunt resister itself, to be located in a control box under the car and close to the pair of

* Mr. Peters is Railway Equipment Engineer, Westinghouse Electric & Manufacturing Company.

† Mr. Cummings is General Engineer, Westinghouse Electric & Manufacturing Company.



Floor Plan of the Erie Double Power Plant Oil-Electric Rail Car



Erie Oil-Electric Mail and Baggage Car Equipped with Two 300-hp. Power Plants

motors they affect. A 32 cell MVA-13 Exide Ironclad storage battery, arranged in trays of four cells each, is located beneath the car and supplies power for engine starting, lights and auxiliary circuits.

All auxiliary low-voltage contactors, knife switches and fuses are located on an accessible rear-connected panel in the engine-room bulkhead, where they are available for inspection at any time.

Brakes and Heating Plant

In addition to the usual brake valve and master controller at the operating station there is an auxiliary controller for engine starting, lights, and series-parallel selection and a meter and gage panel box which contains air-brake gages, temperature indicators for oil and water for each engine, main generator and battery ammeters, and a car-speed indicator. The electric instruments on the panel are of the edge mounted type with rear illuminated scales and have good visibility at night without giving unwanted illumination at the operator's station. Each power plant is equipped with a watt-hour meter. The brake system is equipped with a deadman's pedal which gives an emergency brake application and cuts off the power from the traction motors in case the pedal is released while the car is in operation.

Heat for both the motor car and the trailers is supplied by an oil-fired steam boiler located in the baggage compartment, making it possible to use standard coaches as trailers.

When the car is in service the engines supply sufficient heat for the engine room but during layovers it can be heated from the car heating plant by radiators.

The Principal Weights, Dimensions and Operating Data of the Erie Oil-Electric Rail Car

Road number	5,000
Engine rating	300 hp.
Total installed horsepower	600 hp.
Average weight ready for service	193,700 lb.
Length over couplers	77 ft. 3 in.
Driving axles—front and rear trucks	4
Maximum starting tractive force	22,600 lb.
Tractive force continuous at 26 m.p.h.	5,700 lb.
Maximum safe speed	80 m.p.h.
Diameter of drivers	36 in.
Gear ratio	20.53
Journals (front truck) roller bearing	6½ in. by 12 in.
Journals (rear truck) roller bearing	5½ in. by 10 in.
Length of baggage compartment	23 ft. 1½ in.
Length of mail compartment	30 ft. 1 in.
Length of engine room	18 ft. 2 in.
Wheel base, front truck	7 ft. 9 in.
Wheel base, rear truck	7 ft. 4 in

Skids Prove Their Worth

(*Continued from page 410*)

and skid unloaded in 4 hrs. what it would require 10 hrs. to do with the two-wheel warehouse truck, or if taken on the tonnage basis, the hand lift truck will unload 21,600 lb. in 4 man hours as compared to 8,400 lb. in 4 man hours with the two-wheel warehouse truck.

In the handling of cement, at 5 sacks a load, it required 20 min. to unload 50 sacks that were trucked a distance of 60 ft., by the old method of handling. By the skid and power-lift truck method, 50 sacks were moved a distance of 60 ft. in 3 min. In continuous operation, it was found that one man hour with the power-lift truck accomplished results formerly requiring 6⅔ man hours with the hand-push truck.

The adoption of this method has proved its value by the quick movement of freight on the Atlantic seaboard, that is necessary in order to effect the delivery to a steamship within permit time. Freight received at Atlantic seaboard for export, coastal or inter-coastal movement, moves mostly on passenger steamers which have definite sailings, and freight must necessarily be alongside of the steamers in ample time to provide proper stowage. Between 75 and 80 per cent of the total freight received at the Port of New York for steamer delivery moves on what are termed "short-time" permits, necessitating the delivery of the freight alongside the steamer approximately 12 hrs. after its arrival at the seaboard yards of the various railroads. When one stops to consider that there is a definite amount of so-called paper work, switching, placing of barges, moving of freight from car to barge and towing to the steamer side, it will be realized that it was necessary to adopt some method of handling freight to facilitate its movement and insure its delivery in the most expeditious and economical manner.

Skid operation has not only been established, but has proved itself practical, and has sufficient merit to justify its continuance, as there are today many concrete examples showing typical results in the expeditious and economical handling of freight by manufacturing plants, railroads, and steamship companies, and labor savings over previous methods show as many as 5 or 6 re-handlings eliminated.

Further savings in inventory costs, packing, boxing and other common items of expense, show savings up to 81 per cent of labor cost loading and unloading cars.

Petroleum Rates Revised

WASHINGTON, D. C.

A GENERAL revision of freight rates on petroleum products in carloads, in and between southern and official territories and from points in Illinois, Missouri, Kansas, Oklahoma, Arkansas, Louisiana and Texas to destinations in those territories, as well as within the southwestern territory and from mid-continent groups to Kansas City and St. Louis, is prescribed by the Interstate Commerce Commission in reports made public on February 16 in Parts 4 and 4-a of its general rate structure investigation, undertaken in response to the Hoch-Smith resolution. The rates prescribed are based on a series of scales, in some cases related to the class rate scales, which seem to provide for considerable reductions in the Southwest and some increases in the South and East, but there is considerable dispute among the commissioners as to their probable effect as well as to their propriety, and the commission has not entered orders but states that it expects the carriers to establish rates in conformity with the findings in 120 days.

Commissioner Eastman, in a separate opinion, dissenting in part, said that instead of taking the competition by pipe line, tank vessel and tank truck into consideration the commission has decided that a sounder principle to follow is to fix a maximum reasonable level and let the carriers, in the exercise of managerial discretion, determine how far they will cut under this level for the purpose of meeting competition.

In Part 4 the commission has prescribed a scale of rates on gasoline and other petroleum products from shipping points west of the Mississippi river to destinations in the East. Rates from shipping points in Illinois and the East and from Louisville and Norfolk to destinations in the East are based on 32.5 per cent of the first-class rates prescribed in the eastern class rate case. Rates from points west of the Mississippi to destinations in the South are stated in another scale and rates for application within the South in another. In Part 4-a various group relationships are prescribed and a scale is proposed for general application.

Several of the commissioners in separate opinions express almost as much criticism of the proposed rates as the majority has for the present rate structure. Chairman Brainerd dissented in both cases, stating that the rates prescribed are unreasonable and too high to meet competition. Commissioner Eastman, dissenting in part, said he thought the southwestern rates establish a close approximation to a maximum reasonable level, but he objected because the rates for the East and South were made so much higher, as well as to other inconsistencies. He also said the fixing of maximum rates is "hardly more than a benevolent gesture" and that if the carriers wish to secure as much revenue as possible from this traffic they will do well to disregard the maximum rates and devote their attention to the existing competition and "still more to that which can be foreseen in the near future." However, he objected to the fixing of rates with reference to carriers' revenues instead of in relation to transportation characteristics of the traffic. Commissioner Lewis dissented in Part 4 and partially dissented in 4-a, stating that he could concur in a reasonably high rate on these products so as to make possible a lighter burden on agricultural commodities but that he could not concur "in boosting rates in the South and East if it means as it does here the re-creation of discriminations."

Commissioner Porter dissented from the findings in Part 4-a, saying that petroleum products represent a traffic on which the roads could well be enabled to recoup in part the losses from the reductions in grain rates but that the rates proposed will cause a further reduction in revenue to the Southwestern roads. Commissioner Mahaffie also objected to the southwestern rates, saying they are below a proper level and will result in a considerable reduction in carrier revenue already in a "depleted condition." Commissioner McManamy dissented in the southwestern case on the ground that the rates prescribed for that territory are approximately only 23 per cent of first class while those for the South and East are on the basis of 32.5 per cent of first class. Commissioner Meyer concurring in the Part 4 case, said that a harmonious rate structure on petroleum and its products seems to be impossible because of competition by water, pipe line and truck and that "no rate maker can keep inconsistencies out of petroleum tariffs and also retain a substantial volume of traffic for the railroads."

The southwestern report includes a discussion of the financial condition of the carriers up to 1928, saying that the record as a whole leads to the conclusion that the carriers in the southwestern region have greatly improved in financial condition and "compare favorably with the carriers in other regions of the western district." The net railway operating income of 35 carriers is said to have represented an average return of 6.45 per cent on tentative or final valuations, adjusted for additions, betterments and retirements, in 1927.

Motor Transport Hearings Continue

THE Interstate Commerce Commission brought nearly to a conclusion its series of hearings in Docket 23,400, Co-ordination of Motor Transportation, with sessions at Denver, Colo., on February 9, and at Omaha, Neb., beginning February 14. As at previous hearings, Examiner Leo J. Flynn presided, and was assisted in the examination of witnesses by Examiner Albert E. Stephan.

The first witness at Denver was B. H. Taylor, vice president in charge of traffic of the Denver & Rio Grande Western. Mr. Taylor testified that the D. & R. G. W. suffered a decrease of 64.7 per cent in the volume of its passenger traffic between 1922 and 1930, resulting in a loss of passenger revenue amounting to 53.5 per cent. Likewise, l.c.l. freight traffic has been reduced from 20 to 40 per cent.

Mr. Taylor described the situation confronting the D. & R. G. W. as somewhat different from the national situation in that the principal highway competitors of the railway are intrastate rather than interstate lines. This is due to the fact that there are no established interstate motor lines operating in the territory served by the railway. He attributed to store-door collection and delivery service the principal influence in the popularity of motor truck transportation. He said that the motor vehicle laws in Colorado, Utah, and New Mexico do not afford proper regulation of the so-called contract motor truck lines, and that penalties are not severe enough to deter infractions of the law, such as the offering of rates lower than the published rates, collusion with shippers in mis-describing com-

modities, and assessing charges on lesser weights than those actually hauled. The laws of the respective states, he said, do not prescribe methods of keeping accounts which would aid in detecting violations and none of the state commissions is organized to police the operations of common carrier lines operating under its jurisdiction. Mr. Taylor testified that, in his opinion, motor coaches and trucks should operate under regulation of the same general character as do the railways, and that furthermore they should pay a larger proportion of the cost of constucting and maintaining highways.

The next witness was G. H. Logan, general freight and passenger agent of the Colorado & Southern, who testified concerning losses of traffic by that railroad to highway competitors. L.c.l. freight originating on the Colorado & Southern in 1929 was 52.3 per cent less than that in 1920. Decreases were noted in the l.c.l. tonnage originating at Denver and consigned to all but three of the principal towns and cities on the railway. The decreases were said to be especially notable at short-haul points in northern Colorado, where truck competition is keen, one or more certificated carriers operating to each town. With reference to truck competition for fruit traffic, Mr. Logan said that he knew of the operation of trucks between Colorado and the Rio Grande Valley in southern Texas, a distance of approximately 1,400 miles, the trucks carrying fruit and vegetables southbound and grapefruit northbound. There was also a movement of fruit in 1930 from Grand Junction, Colo., to Texas points, as much as 1,000 miles distant.

J. Q. Dier, assistant general attorney and acting real estate and tax agent of the Colorado & Southern, testified concerning the taxes paid by the railway for road and bridge purposes in Colorado in 1930.

The remaining witnesses at the Denver hearing were representatives of the Colorado Public Utilities Commission and other state departments. A representative of the state inspector of coal mines submitted a table showing that during 1930, there were 974,513 tons of coal shipped by wagon or truck from the various coal mines in the state, while a few years ago practically the entire output of the mines was handled by rail.

T. S. Wood, rate expert of the Colorado Public Utilities Commission, testified that up to and including February 5, 1931, there were in effect in Colorado 458 certificates of public convenience and necessity permitting motor coach and truck operation. These included 119 held by motor truck lines operating on regular schedules, and 62 held by motor coach lines operating on regular schedules. Mr. Wood said that the one-way motor coach fares in Colorado, as a general rule, are about the same as the one-way rail fares, while round-trip fares of the motor coach lines are somewhat lower than railway fares, but that there is no uniformity in the rates charged by the various classes of trucks operated. W. C. Loss, auditor of the public utilities commission testified that there has been a substantial increase from year to year in motor carrier operations in Colorado, particularly with respect to motor truck service and interstate motor coach service.

Among the railways represented by witnesses at the Omaha hearing were the Chicago, Milwaukee, St. Paul & Pacific, the Chicago & North Western, and the Union Pacific. The hearing lasted for several days. The testimony will be reported in the *Railway Age* of February 28.

The final hearing is to be held at Washington, D. C., on March 4.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended February 7 showed a slight decline as compared with the preceding week, amounting to 719,053 cars. This was a reduction of 166,763 cars as compared with the corresponding week of last year and of 236,928 cars as compared with 1929. Reductions as compared with both years were reported as to all districts and all commodity classifications. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

Revenue Freight Car Loading

Week Ended Saturday, February 7, 1931			
Districts	1931	1930	1929
Eastern	167,109	204,747	228,893
Allegheny	145,082	180,757	194,330
Pocahontas	42,599	56,828	61,271
Southern	113,154	134,969	147,893
Northwestern	87,101	109,594	112,392
Central Western	104,989	129,934	135,900
Southwestern	59,019	68,987	75,302
Total Western Districts	251,109	308,515	323,594
Total All Roads	719,053	885,816	955,981
Commodities			
Grain and Grain Products	41,453	43,769	47,837
Live Stock	22,808	25,782	27,521
Coal	138,716	190,083	219,999
Coke	9,356	11,862	13,631
Forest Products	36,440	53,586	59,779
Ore	5,506	7,976	9,337
Mdse. L.C.L.	215,439	241,483	248,825
Miscellaneous	249,335	311,275	329,052
February 7	719,053	885,816	955,981
January 31	719,281	898,835	947,154
January 24	715,690	862,346	926,474
January 17	725,938	847,155	931,861
January 10	714,251	862,461	914,438
Cumulative total, 6 weeks	4,209,595	5,132,368	5,474,590

The freight car surplus for the last week of January averaged 646,750 cars, including 336,577 box cars, 240,292 coal cars, 29,568 stock cars and 14,507 refrigerator cars.

For the first week in February the surplus averaged 654,179 cars, an increase of 7,429 cars. The total included 330,371 box cars, 252,216 coal cars, 30,844 stock cars and 15,088 refrigerator cars.

Car Loading in Canada

Revenue car loadings at stations in Canada for the week ended February 7 totaled 46,978 cars, a decrease from the previous week of 161 cars and a decrease of 10,523 cars from the same week last year.

	Total Cars Loaded	Total Cars Rec'd from Connections
Total for Canada		
February 7, 1931	46,978	29,370
January 31, 1931	47,139	28,815
January 24, 1931	47,613	28,028
February 8, 1930	57,501	38,880
Cumulative Totals for Canada		
February 7, 1931	269,160	160,443
February 8, 1930	327,287	213,824
February 9, 1929	345,773	234,481

THE "FLYING SCOTSMAN" of the London & North Eastern of Great Britain was made up on December 18, of 17 coaches, weighing 563 tons, and the train was one-quarter mile long. This, says the Railway Gazette (London), is a record for the 68 years during which this train has left London for Edinburgh every day in the week except Sunday.

A NEW LINE ON THE FINNISH STATE RAILROAD was recently opened for traffic, according to reports received by the U. S. Department of Commerce. The line, extending from Nurmes in East Finland to Uleaborg on the Gulf of Bothnia, runs through rich forest regions and connects the east trunk line with the western. The total cost of railroad was about $6,829,000.

Safety-Mindedness on B. & O. Chicago Terminal

FREDERICK S. DeVENY, superintendent of the Baltimore & Ohio Chicago Terminal, speaking before the last meeting of the safety committee of that road (Chicago, January 14) presented data showing that the number of injuries to employees in 1930 was only 13, as compared with 82 in the preceding year, a reduction of 84 per cent; and the amount of wages lost by the injured men, $2,976, was only one-fourth the total in the preceding year. There was only one fatal injury in 1930; the first one for 16 months. The Terminal won, for one month in 1929 and for seven months in 1930, the bronze shield, signifying that it held first place in the competition between divisions on the Baltimore & Ohio system.

Mr. DeVeny gives first place in the elements that have brought about this good standing of the terminal, in the matter of safety, to the adoption last year of a scheme for requiring every employee to take part in a campaign to fix in the mind a "rule-a-day." One of the 120 rules in the safety rule book is posted each day in the week and all switchmen, enginemen and firemen are called upon to read and sign for the rule as would be done for a general order. This scheme, started by C. M. Haugh, assistant trainmaster at East Chicago, has worked out with gratifying success. When this posting was begun it was found that few of the switchmen carried the book of rules with them and some, of course, claimed to have read the rules more thoroughly than was actually the case. At the end of 120 days, the whole list of rules had been gone through; but the same process was at once repeated, with the purpose of making sure that every employee on the terminal knew every rule well enough so that whether or not he had the book in his pocket was a secondary consideration. The posting of the rules was begun on May 21, 1929, and at the time of Mr. DeVeny's report, the rotation process had been gone through four times. It is his purpose to continue this arrangement indefinitely, for the benefit of new employees, as well as for the continued benefit of those already in the service. Other divisions of the B. & O. have adopted the plan.

To guard against any flagging of interest on the part of supervising officers, a contest was started; and beginning June 1, 1930, the heads of each of the three principal departments—Trainmaster, Engineer M. W., and Master mechanic—were instructed to have all employees questioned; each head (with aids) to question men in departments other than his own; 50 men in each department. Each would question 50 individuals in the two other departments so that a total of 300 men were questioned each month. A record is made of the names of those employees who are asked to repeat the safety rule for the day, with notes showing who knew and who did not know the rule. This monthly record of efficiency has uniformly shown percentages of 95 per cent or higher.

The total number of men employed by the road is about 2,300; so that examinations of 300 men each month should reach the whole force inside of eight months. Usually the head of each of the three departments appoints five questioners, so that each individual has to call upon only ten men monthly. The questioners are well known throughout the forces so that no formalities are necessary. In the month of December of the 300 men questioned 295 gave satisfactory responses.

This road operates 119 miles of main track and also runs trains over 34 miles of other roads' tracks. On the Terminal's lines there are 393 industries and the passenger trains operated to and from the Grand Central Terminal over the Baltimore & Ohio tracks in one year was 12,674.

Mr. DeVeny began his address before the conference with a little essay on mental discipline, and expressed as his own ideal the ability to possess a power of verbal expression such as would enable him to impress forcibly upon the minds of his fellow workmen the true value of safety. Most of our minds are like Lincoln's, who said that his was like a piece of steel, very hard to scratch anything on; but once a mark was made it was very difficult to rub it out. Let us do that with the safety rules, said Mr. DeVeny.

He believes that the employees of the Terminal are now thoroughly convinced that safety-mindedness is an individual duty toward fellow workmen, as well as toward themselves. Not only have the men become thus educated but most of them are ready to remind a fellow employee when he is seen to be careless, even if the offender be an officer. We have got over thinking that safety rules will slacken the operation of trains. No longer is it the fashion to try to find excuses when things have gone wrong.

Doing your own work strictly according to the requirements of safety is not enough; we must remember that some method of expression is needed. Spoken words have a value that cannot be shown in any other way. We must not only set a good example, we must do something which will create in a fellow worker's mind some emotion and sentiment. Our own silent thoughts are constantly building us up or tearing us down; but to aid in building up one's neighbor, we must recognize the necessity of speaking out those thoughts.

I. C. C. Investigation of All Transportation Proposed

(*Continued from page 414*)

a virtual monopoly of transportation, just as it has recommended to Congress that it be relieved of the great burden of trying to keep pace with changes in the valuations of railroads and of attempting to recapture any excess earnings which may occur among some of them from time to time. Possibly the setting of a time limit for the investigation may serve to call to its attention some features of regulation which could be omitted.

The Fess-Parker resolution also would confer upon the commission the power, in making its investigation, to require, by subpoena, the attendance and testimony of witnesses and the production of books, papers and other documents relating to any matter under investigation. It is understood that it has been somewhat handicapped in its two investigations of highway transportation by the fact that only the railroads were under its jurisdiction, while the highway carriers regarding which it desired information were not.

THE ATCHISON, TOPEKA & SANTA FE has issued an eight-color poster advertising the Century of Progress Exposition to be held in Chicago in 1933. The poster will be distributed in the British Isles, Australia, New Zealand and Continental Europe as well as in the United States.

Looking Backward . . .

One Hundred Years Ago

The Paterson & Hudson River [now part of the Erie] was chartered on January 21, 1831, to construct a railroad from Jersey City, N. J., to Paterson, 14.5 miles. The Elizabeth & Somerville [now part of the Central of New Jersey] was chartered on February 9, 1831, and authorized to construct a railroad from Elizabethport, N. J., to Somerville, 25 miles. A charter was granted on February 17, 1831, to build the Philadelphia, Germantown & Norristown [now part of the Reading]

Fifty Years Ago

The Detroit & Bay City, extending from Detroit, Mich., to Bay City, 110 miles, was sold at Detroit on February 12 under foreclosure proceedings and was bought for $3,625,750 by representatives of William H. Vanderbilt who are understood to be acting in the interests of the Michigan Central.—*Railway Age,* February 24, 1881.

The Atlantic, Mississippi & Ohio [now the Norfolk & Western] was sold at Richmond, Va., on February 10, under foreclosure of the consolidated mortgage. A number of bids were made and the road was finally sold for $8,650,000 to Clarence H. Clark, of Philadelphia, for himself and associates, who are understood to represent parties interested in securing an outlet toward the Southwest for the Shenandoah Valley [now part of the Norfolk & Western], which extends from Hagerstown, Md.; to Roanoke, Va. The A. M. & O. extends from Norfolk, Va., to Bristol and connects with the Shenandoah Valley at Roanoke.—*Railroad Gazette,* February 18, 1881.

Twenty-Five Years Ago

J. L. Eysmans, eastern superintendent of the Star Union Line, has been appointed general freight agent of the Cumberland Valley [now part of the Pennsylvania] at Harrisburg, Pa. H. C. Pearce, general storekeeper of the Chicago, Rock Island & Pacific at East Moline, Ill., has been appointed general storekeeper of the Southern Pacific at San Francisco, Cal. George D. Ogden, division freight agent of the Buffalo & Allegheny Valley division of the Pennsylvania at Pittsburgh, Pa., has been appointed assistant general freight agent at Philadelphia, Pa.—*Railway Age,* February 23, 1906.

On February 19 the United States supreme court handed down a decision in a case brought under the Interstate Commerce Act which establishes the principle that railroads cannot legally deal in the commodities which they haul over their lines. The application of this principle affects most directly the railroads which are engaged in mining and selling coal. The case arose in a suit instituted by the Interstate Commerce Commission in West Virginia to enjoin the Chesapeake & Ohio from performing a contract to deliver to the New York, New Haven & Hartford at New Haven, Conn., 60,000 tons of coal at $2.75 per ton. The price of coal at the mines plus the cost of transportation from Newport News to New Haven was $2.47 per ton, while the published rate from the mine to Newport News was $1.45 per ton.—*Railway and Engineering Review,* February 24, 1906.

Ten Years Ago

The Virginian has received from the builders 1,000 steel gondola coal cars of 120 tons' capacity. This equipment is the heaviest in the history of transportation, is fitted with six-wheel trucks, has no drop doors or means of discharge other than from the top, and is intended to be operated solely on the lines of the Virginian and dumped only in car dumping machines. By using these cars it has been possible to increase the gross trainload from 7,950 tons to 13,200 tons.—*Railway Age,* February 18, 1921.

New Books . . .

Books and Articles of Special Interest to Railroaders

(Compiled by Elizabeth Cullen, Reference Librarian, Bureau of Railway Economics, Washington, D. C.)

Books and Pamphlets

Equipment Trust Securities (Eleventh Issue). Summary of the essential details of important issues which is useful for reference. 368 p. Pub. by Evans, Stillman & Co., New York City. *Apply.*

Soil—Its Influence on the History of the United States, by Archer Butler Hulbert. Essential for the student of "commodities," where they originate and why. Not the least of its good points is the rare tribute that the book pays to those forerunners of settlement, the Scotch-Irish fur-trader, the razorback hog, and the railway surveyors and land departments. Mr. Hulbert fills in some yawning gaps in history and suggests localized efforts to fill in others. 227 p. Pub. by Yale University Press, New Haven, Conn., $2.50.

Uniform System of Accounts for Carriers by Air Prescribed by the Post Office Department for Air Mail Carriers. First issue, approved July 1, 1930. Includes "Chart of Accounts." 100 p. Pub. by U. S. Govt. Print. Off., Washington, D. C., 20 cents.

Periodical Articles

Economic Aspects of the Boulder Dam Project, by Paul T. Homan. Discusses complexity of the issues involved, cost estimates and other figures, long-run economic expediency, immediate economic expediency, political expediency and the policy of federal enterprise in the power industry. Quarterly Journal of Economics, February 1931, p. 177-217.

The Grand Central Terminal. Its extent and operation. Fortune, February, 1931, p. 97-99.

New Zeppelin Rail Car Tested in Germany. Illustrated summary of results of experiments. Science and Invention, February, 1931, cover and p. 887.

The Oil Engine and the Railways, by C. J. Hyde Trutch. "A striking phenomenon of recent years has been the rapidity with which the internal combustion engine has increased its usefulness . . ." Discusses application of various types of oil engines on railways in England and elsewhere. Journal of the Institute of Transport, February, 1931, p. 170-204.

Passenger Train Services at Home and Abroad, by C. E. R. Sherrington. "The choice of such a wide range title. . .was made deliberately in the hope that a search through current information would permit the possible construction of an index by which the passenger train service offered to the general public in various important countries might be measured," p. 212. Table A lists routes and population of cities, distance by shortest route, no. of trains each way all routes, average speed of fastest train; Table B lists representative fastest runs of regular passenger trains summer, 1930 (Gt. Brit., France, Germany, Canada, U. S. A.), and Table C lists passenger train runs of over 150 miles without intermediate stoppage. Journal of the Institute of Transport, February, 1931, p. 212-218.

Substitute Ties and *Tie Renewal Averages Per Mile Maintained.* Appendixes C and D, Report of Committee on Ties, American Railway Engineering Association. Appendix C summarizes reports from railways making tests of substitute ties. Appendix D's tables "for the first time this year include the density of traffic figures." Bulletin of the American Railway Engineering Association, December, 1930, p. 240-252.

Unemployment Insurance: Tabular Analysis of the Legislation in Force. Data classified under countries with voluntary insurance and countries with compulsory insurance. Table I summarizes scope of unemployment insurance. Table II summarizes financial organization. International Labour Review, January, 1931, p. 48-66.

Odds and Ends . . .

An Apt Slogan

One of the most pertinent safety slogans observed in a long time, appeared in the Baltimore & Ohio magazine. It read "You Can't See Out of a Glass Eye."

Operator-Organist

The agile fingers of Raymond B. Hubbs, block operator for the Long Island at Mineola, L. I., guide the movement of both trains and music, and create the necessary harmony in each. In his leisure hours, Hubbs is an accomplished organist whose services are continually required for recitals and who plays regularly each Sunday at the First Methodist church of Central Islip, L. I.

He Should Ride on Trains

A. E. Weimer, clerk for the Pennsylvania at Chicago, was in three automobile accidents within 10 days, in none of which was he at fault. On December 5 a police squad car ran into his car, which was parked at the time. On December 10, another machine collided with his car as he was stopping in front of a house. On December 14, two other cars collided and one of those cars was thrown into Weimer's car. It is not recorded whether Weimer has given up driving.

That New Haven Baby

PHILADELPHIA, PA.

TO THE EDITOR:

Under "Odds and Ends" on page 300 of your issue of January 31, 1931, Mr. Brook asks for a suitable name for the New Haven baby. That is an easy one. It should be called Nina. What is more simple? N.Y.N. is certainly Nin, and H. and H. can as surely be abbreviated into "Hah," which is equal to "ah." There you have it. No fond mother could pick out a lovelier name than that for her first-born.

J. V. HARE.

Railway Smoking

With the present discussion as to whether smoking shall be permitted in dining cars, it may be of interest to know that in England, until December, 1867, smoking was not permitted on trains. At that time, Viscount Ranelagh decided to be a martyr to the cause and persisted in smoking his pipe on the train. He was arrested and fined, but the publicity attending his action was sufficient to cause a bill to be introduced in the House of Parliament for permitting smoking on trains, and the bill was carried after a hot fight.

Railroad Cannot Spank

Authority of a railway employee to administer a sound spanking to a 15-year old school boy for alleged misconduct on a passenger train was denied by Judge Mark M. Boatner of the civil district court in a suit brought against the Louisville & Nashville at New Orleans by Louis F. Vinot, whose son was beaten by Edward Brou, flagman. The parents had instituted suit for $6,000 damages. Judge Boatner rendered judgment of $300. It was charged that the son, Louis Lionel Vinot, had been assaulted by the flagman because he had his feet on the back of a seat.

Layette Service

A mother with a 2½-year-old baby boarded a Northern Pacific train when it pulled away from its west coast terminal. The child was in sleeping garments and was immediately tucked away in its berth. In the morning the discovery was made that the mother had forgotten to bring along the baby's wardrobe. The conductor was advised of a list of apparel required. A young woman employee of the railway at Missoula, Mont., went shopping immediately after a wire was received there from the train conductor. When the train steamed into that station a short time later, the clothing was delivered to the anxious mother.

Gages

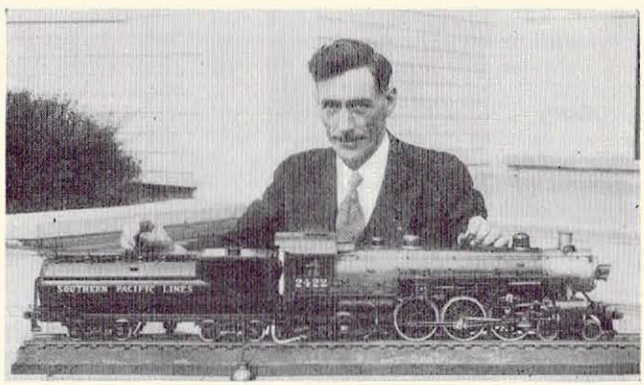
The railways of the Argentine Republic are unique in the variation of gages, the range being from 5 ft. 6 in. on most of the main lines, to 0.6 meter (1.98 ft.) on some of the branches, with 1.435 meters (4.71 ft.), 1 meter (3.28 ft.), and 4 ft. 8½ in. between. The only rival in this respect is Australia, where the range of gages includes 5 ft. 3 in., 4 ft. 8½ in., 3 ft. 6 in., 2 ft.; and 1 meter. Other unusually broad-gage track is in Spain, 1.67 meters (5.5 ft.), and in the U.S.S.R., where the standard gage is 5 ft.

New Use for Remote Control

The remote control on the Boston & Maine at Johnsonville, N. Y., has been giving satisfactory results. It is so proficient that Andrew Stah, third trick train director, claims it is as good as any line of traps he ever saw. Recently, No. 1 crossover would not show reverse indication, so Stah had to use No. 5 crossover instead. In the morning Leon Downing, Western Union lineman, went down to see if he could locate the trouble and found that Stah had caught a large skunk in the point of the switch. Downing says that if Stah catches any more skunks, someone else besides him will have to take care of them, as he is all done with that kind of work. It is said that Stah is thinking seriously of going into the fur business and expects to get a few bob cats or a bear or two before spring.

S. P. Model Builder

From his early boyhood, the hobby of V. T. Shattuck, water service foreman on the Southern Pacific, has been the construction of power models. For the past 10 years he has confined his activities to the building of model locomotives, of which he now has three, a freight engine, a passenger engine, and a yard engine. All these models operate by steam. They were built to a scale of one-half inch to the foot and, with the exception of the few changes necessary to make their operation convenient, conform exactly to the originals. In addition to the locomotives, Shattuck has also constructed a large number of cars, also built by scale. In his equipment are included flat, box, tank, refrigerator, stock, and gondola cars, as well as cabooses. The miniature railroad built by Mr. Shattuck is equipped with passing sidings and electric semaphores. The construction of one of these model locomotives takes all of the builder's spare time for a period of two and a half years, and so perfectly are they built that, without an object of comparison beside it, a picture of the model may easily be mistaken for the original.



Shattuck and His Latest Model

NEWS

I. C. C. Denies Eastern Class Rate Revision

Refuses to consider petition for modification of fifth and sixth class rates

Petitions filed by the eastern railroads for a modification of the Interstate Commerce Commission's order of last May in the eastern class rate revision case, so as to increase the fifth and sixth class rates precribed, were denied by the commission in a supplemental report made public February 14, although the commission made some modifications in its detail findings. The commission also denied the petition for a reconsideration of the finding that rates on certain agricultural products should be excepted from any increases involved in the revision.

The railroads had asserted that the commission's proposed rates would greatly decrease their revenues on class rate and related traffic, not only under existing circumstances, but even under normal conditions, this claim being "predicated upon the informed judgment of traffic executives" and they submitted that the commission "should be most hesitant to prescribe at this time any basis of rates" which would not assure to the carriers at least rates no lower than those under present rates and under normal conditions of business.

These statements were criticized in the replies filed by the shippers who pointed out that the traffic test, made after issuance of the examiner's proposed report in the case, indicates a net increase from the new rates in respondents' revenues of some $20,000,000 or $25,000,000 yearly, based on conditions in 1925. In stating that its own computations support this view, so far as the traffic test can be taken as a guide, the commission said that "it may be conceded, of course, that the actual result may vary considerably, one way or the other, from the test figures."

"Nearly one-half of the respondents' petition is taken up with a plea that fifth class under the new scale should be 40 per cent of first class instead of 35 per cent which we prescribed," says the present report, by Commissioner Eastman, "and that sixth class should be 30 per cent instead of 27.5 per cent. Respondents predict that unless this change is made the reductions in revenue on these classes will more than offset any increases from the higher classes. The shippers' replies to the carriers' petition unanimously oppose any modification in the percentages prescribed for fifth and sixth classes, their view being in general that since respondents have been granted fairly substantial increases in the class rates as a whole, they should be satisfied with rates on fifth and sixth classes which reflect reductions. The aggregate effect of the revision is to increase rates on the four major higher classes, to make a slight increase in fifth class, and a moderate reduction in sixth class. It is unnecessary to make any estimate as to the probable revenue effects of the readjustment here prescribed except to express the view that respondents are incorrect in their belief that the net effect will be to greatly decrease the carriers' revenues from class rate and related traffic."

"The railways are not trying unfairly to cripple their competitors. They are not seeking any unjust advantages. They are asking only for an even break—fair play on the part of the public and equality of opportunity among transportation agencies."

—J. E. Gorman, President, Chicago, Rock Island & Pacific

Ripley Advocates All-New England System

Professor William Z. Ripley of Harvard advocated the consolidation of New England railroads into an all-inclusive system in an address before the transportation division of the Hartford Chamber of Commerce at Hartford, Conn., on February 11.

While Professor Ripley conceded that there is perhaps no way under present laws whereby interests associated with the Pennsylvania can be forced to divest themselves of their present holdings in New England railroads, the speaker nevertheless thought that if the all-New England system were accomplished, these Pennsylvania interests would be willing to sell their holdings at a fair price. In advocating a new all-New England system, Professor Ripley criticized current proposals to allocate the New England roads among the various trunk lines. Such allocations are contemplated in the so-called Rhode Island plan which was outlined in the *Railway Age* of January 31, page 303, and in the plan submitted by Van Sweringen interests as reported in the *Railway Age* of February 7, page 336.

Pennsylvania to Push Improvement Program

$175,000,000 to be spent in 2½ years to complete new stations and electrification

Plans calling for a total expenditure of $175,000,000 and the completion within two and a half years, instead of four, of the extensive program of improvements begun by the Pennsylvania a little more than a year ago, have been announced by W. W. Atterbury, president. Mr. Atterbury pointed out that the proposals "to go forward with redoubled energy" on the improvements would involve "very large expenditures" for labor which would be of great benefit to the unemployment situation.

His statement, in part, follows:

"The Pennsylvania Railroad, a little over a year ago, embarked upon an extensive program of improvements. The plan called for an expenditure during the year 1930 of about $90,000,000, but actually $106,000,000 of construction work was done.

"It had been planned that the remainder of the work would be spread over a period of four years. However, the Pennsylvania has come to the conclusion that now is the time to go forward with redoubled energy, and it has accordingly decided to complete this work, if possible, within approximately two and a half years.

"The plans in hand call for improvement items totaling in cost some $175,000,000.

"It is our view that commodity prices are now at a level, and the efficiency of labor is so great, that these improvements can be definitely contracted for on exceptionally favorable bases. Furthermore, at a time like the present, with reduced traffic, the work can be done with much less interference from the movement of passing trains which, of itself, would constitute a definite economy.

"The improvements contemplated will involve the use of upward of 150,000 tons of steel; the purchase of 240 electric locomotives, and the electrification of 80 passenger cars; and, in addition, there will be very large expenditures for labor which will be a great benefit to the unemployment situation.

"The projects which will now be pushed forward to completion are:

(a) Electrification of the remaining portions of all the lines of track between New York and Washington, including electrification of the entrance to Potomac yard.

Continued on Next Left Hand Page

BETTER FUEL performance as well as HIGHER POWER

■ The new 2-10-4 type locomotives recently built by Lima for the Chesapeake and Ohio Railway were designed to meet a specific operating problem calling for high horsepower output.

■ While meeting the requirements of transportation by pulling full tonnage trains from Russell, Ky., to Toledo, Ohio, without cutting, they are also saving 14% in fuel as compared with the Mallets formerly used.

■ This economy is made possible by incorporating Super-Power Principles in the new design.

LIMA LOCOMOTIVE WORKS
INCORPORATED

LIMA - - - - - OHIO

LIMA LOCOMOTIVE WORKS INCORPORATED

(b) The completion of the new station now under way at Philadelphia.

(c) Extensive improvements in and near Newark, including the erection of a new passenger station and the building of a new bridge over the Passaic river. This will involve the abandonment of Manhattan transfer.

(d) Six-tracking of the line through Elizabeth, N. J.

(e) The building of a new line around Trenton, N. J., including the construction of a new bridge over the Delaware river.

(f) Extensive improvements at Baltimore, Md., including the removal of numerous grade crossings and the building of new four-track tunnels into and out of Baltimore.

(g) Other undertakings of less magnitude at different points on other portions of the railroad.

"The making of these improvements will obviously involve new financing, but the Pennsylvania Railroad, in view of existing low interest rates and the plethora of savings in the country that are clearly available for investment as soon as confidence is restored, regards the present and the near future a most favorable occasion for the necessary financing. Plans have been made accordingly.

"Believing, as we do, so firmly in the future of this country, and knowing the demands for service which the inevitable restoration of business activity will make upon the railroads, and in view of the further fact that the existing low volume of business can be only temporary, the Pennsylvania Railroad considers that now is the time to express its confidence in acts."

Two Years—None Killed

Employees of the Los Angeles & Salt Lake have performed their duties from December 15, 1928, to January 1, 1931, without a fatal injury. During 1930 the man-hours worked totalled 13,551,378, while the accident frequency was 1.32 per million man-hours.

Court Voids Injunction Against S. P.

The federal circuit court of appeals at San Francisco, Cal., has reversed a decision granting an injunction to the Western Pacific by the federal district court to prevent the Southern Pacific from completing and operating a three-mile branch line in the vicinity of San Mateo, Cal.

St. Louis-California Time Cut

The Wabash, the Union Pacific and the Southern Pacific have shortened the passenger train schedules of their St. Louis-San Francisco service 5½ hrs. westbound and five hours eastbound. Cars now leave St. Louis at 7:30 p. m. instead of 2 p. m. and arrive in San Francisco at 8:30 a. m. the third day, as previously. Returning, they leave San Francisco at 6 p. m. instead of 9 p. m. and arrive in St. Louis at 8:25 a. m. the third day instead of 4:20 p. m.

One Cent a Mile

The Western Pacific and the Atchison, Topeka & Santa Fe, following the announcement of the Southern Pacific that it would establish round trip rates equal to one cent a mile from February 20 to 27, have decided to make similar reductions during the same period. The Western Pacific offers the low rates throughout its entire system, while the Santa Fe has placed the low rates in effect from Bakersfield, Cal., to points north.

Regional Advisory Boards

The following shippers' regional advisory boards will meet during March: The Southwest Shippers' Advisory Board on March 5 at Houston, Tex.; the Southeast Shippers' Advisory Board on March 6 at Atlanta, Ga.; the Ohio Valley Shippers' Advisory Board on March 17 at Columbus, Ohio; the Trans-Missouri-Kansas Shippers' Advisory Board on March 18 at Kansas City, Mo.; the New England Shippers Advisory Board on March 19 at Springfield, Mass.; and the Great Lakes Regional Advisory Board on March 25 at Cleveland, Ohio.

Correction

Through a typographical error in describing the new Cotton Belt 4-8-4 type locomotives on page 1363 of the *Railway Age* of December 27, the sentence referring to the feedwater-heater installation was confused and should have read: "The Worthington Type S heater was used, although the tests were conducted on the older Type BL heater and indicated that approximately 15 per cent of the water used was recovered, with a fuel saving of 6 to 15 per cent, depending on the load factor and the operating conditions."

Security Owners to Discuss Waterways

The New York Discussion Group of the National Association of Owners of Railway and Public Utility Securities will hold a meeting on February 27, the topic for discussion being Inland Waterways and Railway Credit. Among the speakers will be General T. Q. Ashburn, chairman of the government's Inland Waterways Corporation; Dr. Harold G. Moulton of the Brookings Institution; D. B. Robertson, president, Brotherhood of Locomotive Firemen and Enginemen, and Samuel O. Dunn, editor, *Railway Age*. The meeting will be held at 6:15 in the evening at the Hotel Commodore and will be preceded by a dinner. Information and reservations may be secured from the Security Owners Association, 21 East Fortieth Street, New York.

Freight Traffic in 1930

Freight traffic handled in 1930 by the railroads totaled 422,116,659,000 net ton-miles, according to reports compiled by the Bureau of Railway Economics. This was a reduction of 70,196,763,000 net ton-miles, or 14.3 per cent, under that for 1929 and a reduction of 11.5 per cent under that for 1928. In both the Eastern and Southern districts there were reductions of 14.6 per cent in the amount of freight handled in 1930 compared with 1929, while the Western district reported a reduction of 13.6 per cent.

In December, freight traffic handled by the Class I railroads amounted to 29,025,837,000 net ton-miles, a reduction of 7,020,552,000 net ton-miles, or 19.5 per cent, below that of the same month in 1929. In the Eastern district the volume of freight handled by the railroads in December was a reduction of 20.1 per cent under that of the same month the year before, while the Southern district reported a reduction of 19.1 per cent. The Western district reported a reduction of 18.7 per cent.

Railway Employment Reduced in December

A reduction of 37,679 in the number of employees in the service of the Class I steam railroads between the middle of November and the middle of December was reported by the Interstate Commerce Commission in its monthly statement of railway employment statistics, showing a total of 1,356,724 as of the middle of December. This was a decrease of 15.47 per cent as compared with December, 1929, and of 16.35 per cent as compared with December, 1928. In November the total number was 1,394,403.

"Yellowstone Comet" Running Time Shortened

The Chicago, Burlington & Quincy and the Northern Pacific will, on June 20, reduce the running time of the "Yellowstone Comet" so that eastbound passengers from the Park will arrive in Chicago in the morning instead of the following evening. The train will leave Chicago at 11:40 a.m. instead of 10:45 a.m. and will arrive at Gardiner at 10 a.m. the second day as formerly and Cody at 7:15 a.m. as formerly. Eastbound, the train will leave Gardiner at 5:45 p.m. instead of 7:55 p.m. and Cody at 7:15 p.m. as formerly, and will arrive in Chicago at 9 a.m. the second day instead of 8 p.m.

Freight Performance in 1930

The average speed of freight trains in 1930 was the highest for any year on record, according to reports compiled by the Bureau of Railway Economics. The average was 13.8 miles per hour, which was an increase of six-tenths of one mile above the best previous record established in 1929. The daily average movement per freight car in 1930 was 28.7 miles, a reduction of 3.6 miles under that for 1929.

The average load per car in 1930 was 26.7 tons, including less than carload freight as well as carload freight. This was a decrease of two-tenths of one ton below the average for 1929.

Bethlehem Pours a 230-Ton Steel Casting

The largest steel casting ever poured has been produced in the Lehigh plant of the Bethlehem Steel Company at Bethlehem, Pa. The casting is a platen, or cylinder jacket, for the 14,000-ton forging press at the Bethlehem plant and has a height of 12 ft. 10 in., a length of 23 ft. 4 in., and width of 10 ft. 2 in. It weighs 460,000 lb. Six open-hearth furnaces were required to melt the steel. In pouring, the mold was filled in approximately 10 min. and the total time, including the filling of the sink-heads during the cooling of the metal in the mold, required 38 min. The casting was allowed

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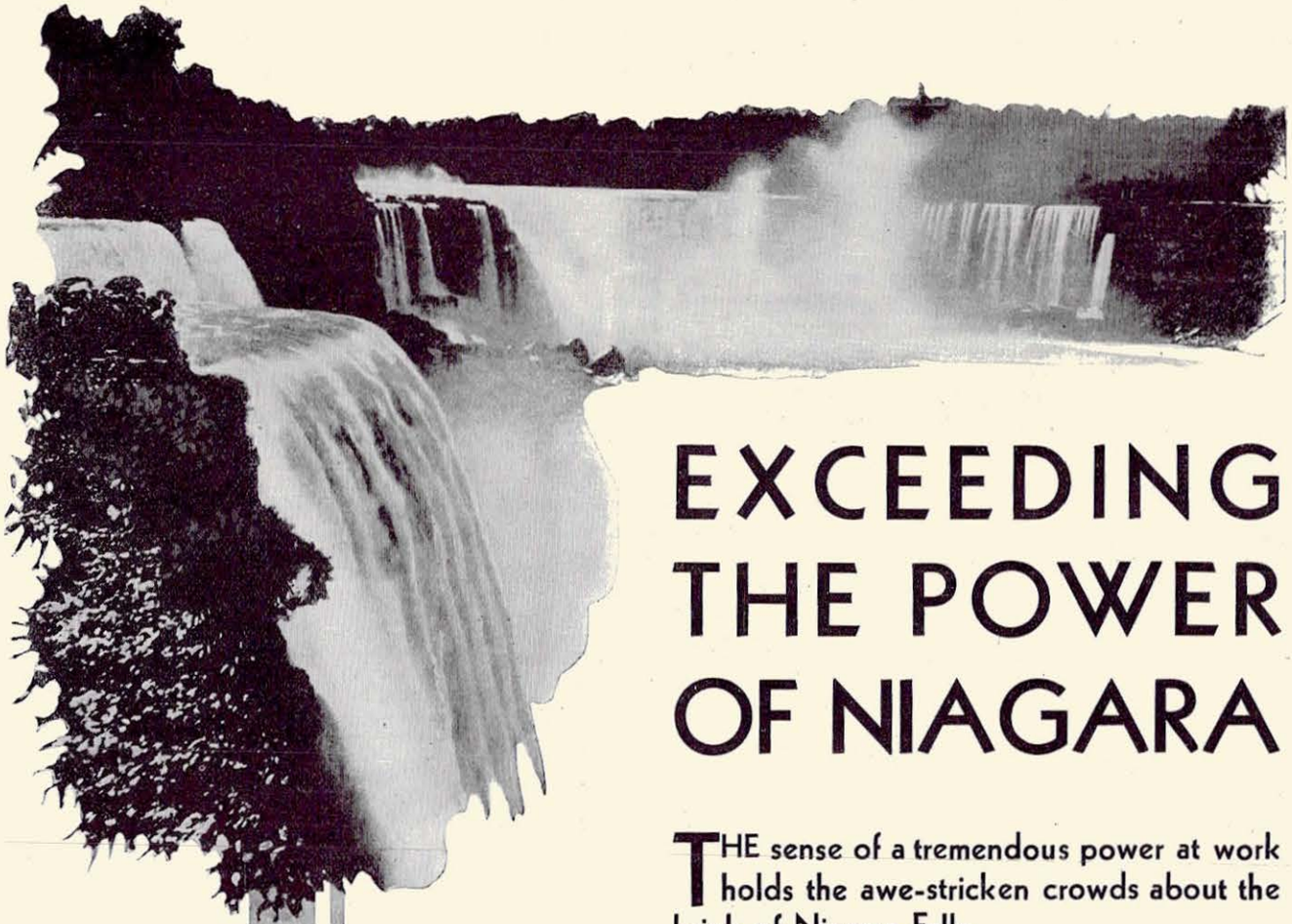


EXCEEDING THE POWER OF NIAGARA

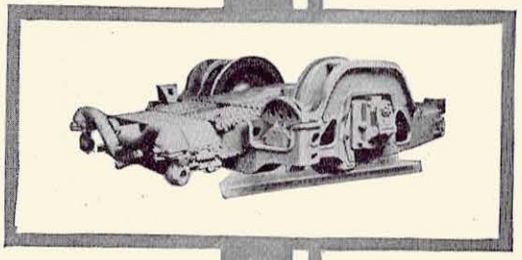
THE sense of a tremendous power at work holds the awe-stricken crowds about the brink of Niagara Falls.

■ From the American Falls, three-quarters of a million horsepower is generated and put to useful work.

■ Large as this is, the 4,200 Locomotive Boosters now in service exceed it by 720,000 horsepower.

■ Less spectacular in its working because it is in an obscure place where it attracts no attention, it is difficult to appreciate that The Locomotive Booster is adding the equivalent of 1,155 locomotives of 40,000 lbs. draw-bar pull to the power of the railroads.

■ This power is available in starting, on the ruling grade and whenever emergency demands.



FRANKLIN RAILWAY SUPPLY COMPANY, Inc.

NEW YORK CHICAGO SAN FRANCISCO ST. LOUIS MONTREAL

to cool in the mold ten days before cleaning was attempted.

Motor Freight Traffic Survey

Rapid extension of improved highways in the United States, growth of commercial traffic over the highway system and resultant problems are stated as the reasons for a study of highway transportation to be undertaken jointly by the United States Bureau of Public Roads and the Transportation Division of the Bureau of Foreign and Domestic Commerce. The basis of the study will be a field survey of motor freight traffic, throughout the entire United States. Representatives of the Bureaus are now in the field to interview representative motor freight operators.

"Unlimited" Commutation Tickets

Monthly, quarterly and annual commutation tickets are now issued by the Pennsylvania for travel between Philadelphia and suburban stations west of that city as far as Paoli, 20 miles (17 stations), bearing the words "unlimited use." In other words, the holder can use the ticket within the time limit, for as many trips as he pleases. The ticket is as convenient as a season pass, no punching being required. The price is slightly higher than that of the regular commutation ticket. The monthly ticket must always begin on the first of the month; the quarterly tickets must terminate at the end of March, June, September or December, and the annual ticket at the end of December.

Objection to Increased Rates on Alaska Railroad

A vigorous protest against the increases in freight and passenger rates on the government's Alaska Railroad, recently announced by the Secretary of the Interior, on recommendation of a special Senate committee headed by Senator Howell, of Nebraska, for the purpose of reducing its deficit, has been sent to Congress by the Seattle (Wash.) Chamber of Commerce. The protest stated that the road was not built "for the purpose of having the government enter the field of railroad money-making" and it asked Congress to make an emergency appropriation of $500,000 to render the rate increase unnecessary.

A. E. Clift Sees Recovery

A. E. Clift, president of the Central of Georgia, believes that "the bottom has been scraped in the depression and that the upward trend in an orderly and progressive manner depends upon the people of the country putting aside hesitation, indecision and fear and getting down to hard, intelligent work in solving problems that arise from day to day." Mr. Clift is one of 2,304 representative business leaders who contributed their opinion of what should be done to bring back prosperity, in a survey just completed by the Sherman Corporation, business and management engineers, New York.

He considers "railroad operation a fundamental public necessity and that an efficient system of transportation adequate to meet the needs of the nation's business is essential to progress." In order to aid the railroads in providing the necessary high standards of transportation, Mr. Clift suggests that government action be urged along lines advocated by the Association of Railway Executives in their recent declaration of policy. This declaration was published in the *Railway Age* of November 22, 1930, page 1087.

The survey, according to an analysis issued by the Sherman Corporation, revealed that "An undercurrent of resentment toward law-making bodies is one of the outstanding facts" developed. "The resentment means," the analysis continues "that many men believe legislative interference with the normal workings of economic law and principles is one of the present big handicaps to business."

Mechanical Division Will Meet at Chicago

The twelfth annual meeting of the American Railway Association Mechanical division, is scheduled to be held June 23, 24 and 25 at the Congress hotel, Chicago. This will be a business session with the proceedings largely limited to the reports of important standing committees. Other committees will present reports in case they have recommendations with an important bearing on economy and efficient operation. Plans are being made for one or two well-known railway executives to address the division. Railway supply men interested in the reports or the discussion will be welcome, but no entertainment features are scheduled and there will be no exhibition of equipment or supplies in connection with the convention.

North Western Acquires Motor Coach Line in Iowa

The Chicago & North Western, through its motor coach subsidiary, the Interstate Transit Lines, has bought the motor coach operations of the Fort Dodge, Des Moines & Southern Transportation Company, a subsidiary of the Fort Dodge, Des Moines & Southern, an electric railroad in central Iowa. The transfer of the motor coach operations has been approved by the Iowa Board of Railroad Commissioners and will become effective on March 1.

The lines now acquired comprise 550 miles, and 36 motor coaches from Knoxville, Ottumwa and Indianola on the south, through Des Moines and Ames to Fort Dodge, Webster City, Algona, Marshalltown and Waterloo on the north. The operations will be fully coordinated with those of the Interstate Transit Lines.

Freight Credit Rules Liberalized

A revision of the rules under which the railroads are authorized to extend credit for the payment of freight charges was promulgated by the Interstate Commerce Commission on February 16 following its investigation undertaken at the request of the National Industrial Traffic League which had asked for an extension of time, which the railroads opposed. The commission holds that it has had no authority to issue an order requiring carriers to grant credit, but that the law as amended in 1927, gives it additional freedom of action enabling it to prescribe rules permitting the carriers to depart from a cash basis, and the regulations are somewhat liberalized in the revision along the lines of drafts submitted by the railroads and approved by the league.

Whereas the 1920 rule fixed 96 hours as the maximum time for which carriers should extend credit, the revised rules provide for a period of 48 hours in ordinary cases or 96 hours under precautions to be taken by the carrier deemed by it sufficient to assure payment. It is provided that the credit period may run from the first 12 o'clock midnight following the delivery of the freight and that if shippers elect to have their freight bills presented by mail the time of mailing by the carrier shall be deemed the time of presentation

A period of up to 30 days also is allowed for the presentation of bills for additional charges and a period of 15 days is allowed for such items as icing charges which are not determinable at the time the shipment moves, and for demurrage under average agreements. Representatives of the league had advocated an extension of the credit period for a maximum of seven or eight days to allow the shipper more time to check the bills.

Interstate Vehicles Must Pay Georgia Mileage Tax

The right of Georgia to impose a mileage tax on motor carriers engaged in interstate commerce was upheld in a recent decision of the Federal District court for the Northern District of Georgia. The case was the petition of the Johnson Transfer and Freight Lines et al for an injunction to restrain the Georgia Public Service Commission from enforcing certain provisions of the Georgia Tax Act of 1929.

According to the court's summary of the facts the Johnson Lines, the principal complainant, operates as a common carrier between Birmingham, Ala., and Chattanooga, Tenn. No business is done in Georgia but the route over which the Birmingham-Chattanooga operation is conducted passes for 23 miles through Georgia. The complainants applied for a Georgia license and for certificates of convenience and necessity. The commission refused to entertain the application unless certain conditions were met, including the posting of a deposit of $75 as a guarantee that the mileage tax would be paid. The complainants objected, and proceeding to operate without a certificate, were prosecuted.

Their plea for exemption from the Georgia requirements is upheld in the present decision with regard to certain conditions the commission sought to impose. In connection with the mileage tax, however, the court holds that "As an occupation tax on doing interstate carriage it would fall, except that it is not for the mere privilege of doing a carriage business, but for doing it on the public highways, where such business cannot be done as a matter of absolute right, either in interstate or intrastate commerce."

The tax involved amounts to three-fourths of a cent per vehicle mile which

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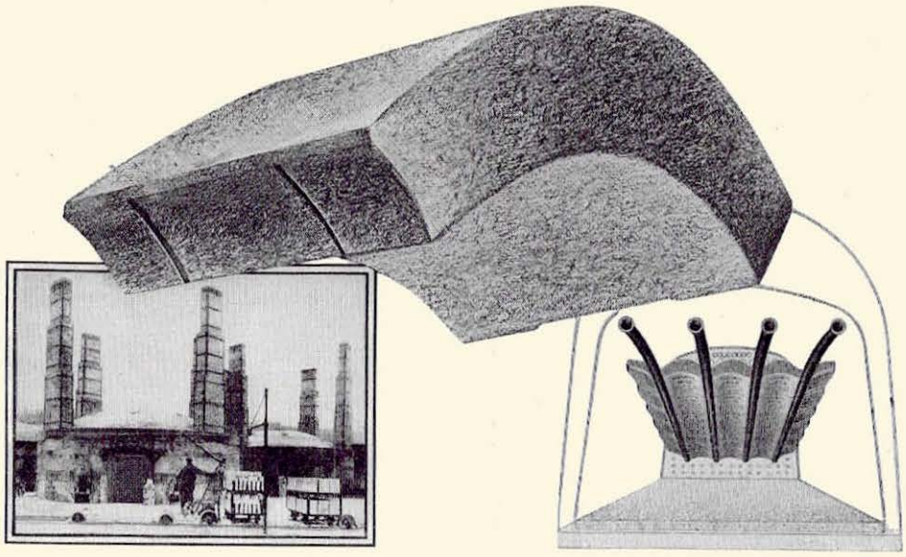
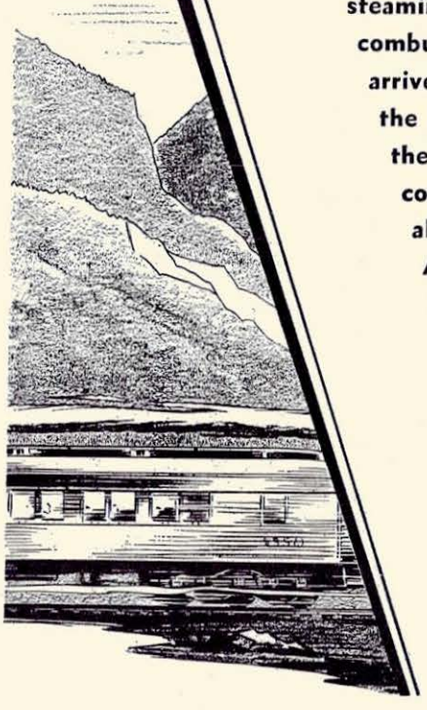
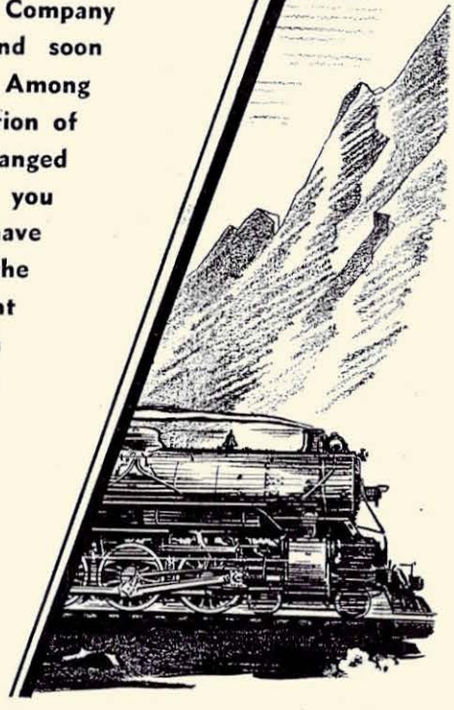
Call the ARCH Service Man



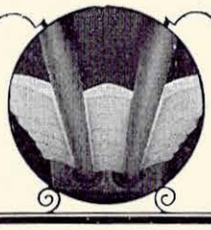
THERE'S MORE TO SECURITY ARCHES THAN JUST BRICK

The engines, recently out of the back-shop, were not steaming properly. • • American Arch Company combustion experts were called in and soon arrived at the source of the trouble • • Among the changes suggested was the alteration of the Arch design, necessitated by changed conditions of firing. • • Whenever you alter combustion conditions, have American Arch Company check the locomotive Arch. Often a slight change in Arch design will mean the saving of a lot of fuel over the division. • • Keeping locomotive Arches up-to-date is one of the valued services American Arch Company has been rendering the railroads for 21 years.





Harbison-Walker Refractories Co.
Refractory Specialists



American Arch Co.
INCORPORATED
Locomotive Combustion Specialists

the court finds "is not shown to be actually burdensome to interstate commerce," adding that "For aught we know it is well worth to the owner the 17½ cents charged for his truck to travel the 23 miles in Georgia over a paved highway instead of an unpaved dirt road."

Commercial Stocks of Coal

Commercial stocks of bituminous coal amounted to 37,200,000 tons on January 1, according to the quarterly survey by the United States Bureau of Mines, Department of Commerce. In comparison with the amount on hand at the beginning of the previous quarter, this is an increase of 1,300,000 tons but it is 3,100,000 tons less than the quantity in storage on January 1 last year. Exports during the last quarter of 1930 averaged 331,000 tons a week, as against 382,000 tons in the preceding quarter. The weekly rate of consumption within the United States during the fourth quarter of 1930 amounted to 8,987,000 tons, as compared with 7,370,000 tons in the previous quarter. In comparison with the average weekly rate of consumption during November and December 1929, however, the rate of home consumption plus exports for the period under review, shows a decrease of 16.6 per cent. In addition to the stocks in the hands of consumers there was 8,940,000 tons of bituminous coal on hand on the docks of Lake Superior and Lake Michigan on January 1, as compared with 9,804,000 tons on October 1.

Stocks of railroad coal have increased during the last quarter. The American Railway Association reports that on January 1 there was 7,073,000 tons on hand. In comparison with the quantity in storage three months earlier this is an increase of 928,000 tons but as shown by the table below, is somewhat less than the tonnage held by the railroads on comparable dates in other recent years.

January 1, 1923	6,757,000
January 1, 1924	19,368,000
January 1, 1925	12,156,000
January 1, 1926	11,066,000
January 1, 1927	13,499,000
January 1, 1928	14,729,000
January 1, 1929	9,237,000
January 1, 1930	7,442,000
October 1, 1930	6,145,000
January 1, 1931	7,073,000

Sense and Nonsense on Parcel Post Rates

Senator McKellar, of Tennessee, one of the foremost advocates of Congressional rate-making, persuaded the Senate to adopt on February 16 a resolution "that it is the sense of the Senate that the pending application of the Postmaster General to the Interstate Commerce Commission" for its consent to a revision of parcel post rates "should not be pursued to a final adjudication, with any application of new rates for parcel post, until same have been reported to Congress and been passed upon by Congress." This was adopted in place of another resolution introduced by Senator McKellar—which had been approved by a majority of the postoffice committee of the Senate—to request the Postmaster General to withdraw his request to the commission, until a new law could be passed. The commission had assigned the case for hearings beginning on February 19. The substitute was adopted after it had been pointed out that the proposed resolution was tantamount to a request that the Postmaster General pay no attention to the law passed by Congress in 1916 directing him to "reform" the parcel post rates, with the consent of the commission, if he shall find on experience that they are such as to prevent the shipment of articles desirable or to permanently render the cost of service greater than the revenue. Senator McKellar had told the Senate that the commission "tomorrow is going to pass upon the request of the Postmaster General to raise parcel post rates by more than $7,000,000" and that the commission ought not to proceed in the direction of raising rates until the Postoffice committee of the Senate shall have had time to investigate and determine what the rates ought to be. Senator Moses pointed out that the proposed revision would increase the rates in the nearer zones and on the smaller weights of packages but would decrease them in the farther zones and on the larger weights of packages, in addition to increasing the size limit on packages, thus bringing the postoffice into keener competition with the express company. Senator McKellar said he would agree to change his resolution to provide only that rates shall not be increased. Senator Moses pointed out that the passage of either resolution would effect nothing, because the Postmaster General has proceeded under a statute.

Large Marble Block for Unknown Soldier's Tomb

What is probably the largest piece of marble ever transported across the country by rail was shipped from Marble, Colo., to Proctor, Vt., during the period from February 5 to 14. The block weighed 56 tons, measured 14 ft. x 7 ft. x 6 ft., and was consigned to the Vermont Marble Company at Center Rutland, Vt., where it will be finished and then forwarded to Washington, D. C., for erection in Arlington Cemetery at the Unknown Soldier's Tomb. The shipment was handled by the Crystal River & San Juan from Marble to Carbondale; by the Denver & Rio Grande Western from Carbondale to Pueblo; by the Atchison, Topeka & Santa Fe from Pueblo to Kansas City, Mo.; by the Missouri Pacific from Kansas City to St. Louis; and by the Pennsylvania, the New York Central and the Rutland from St. Louis to Proctor.

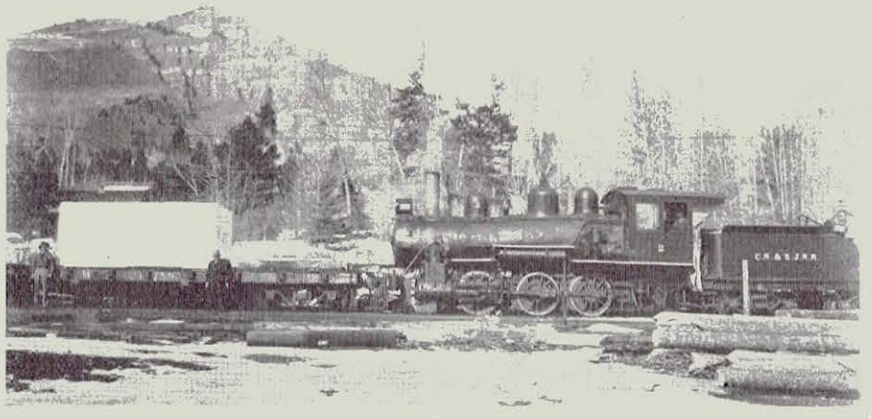
The marble was quarried in an open top mine of the Yule Colorado Marble Company at Marble, at an elevation of 10,000 ft. above the sea, and was lifted from a depth of 125 ft. by special machinery. The Yule Colorado Marble Company, which is owned by the Vermont Marble Company, operates an electric line between the quarry and the station of the Crystal River & San Juan, but its cars could not be used in handling this block so a special skidway of oak timbers was built, the skid for the marble was equipped with small wheels and the block was snubbed down the steep mountain grade to the station, a distance of 3½ miles, where it was loaded on a standard gage flat car.

Report of New York State Commission

The Public Service Commission of New York, Milo R. Maltbie, chairman, presented to the legislature on February 16 its annual report for 1930. The work of the commission has expanded materially during the year and the testimony taken at public hearings during the 12 months covered more than 80,000 pages, which is 40 per cent more than in 1929. The report repeats the recommendation that bus companies and water companies should be brought under state supervision. All public utilities, including the railroads, are mildly criticised for not trying harder to improve business by reducing rates.

The commission regrets to approve abandonment of stations and curtailment of service but has been obliged to do this extensively because of the shrinkage in volume of traffic. Competition of highway traffic with railways is discussed, but the Commission has no new remedy. "But it is not a necessary part of social progress that auto transportation be allowed to skim the cream of the freight and passenger traffic, leaving the railroads to take what is offered and when it is offered with no choice."

Pending before the Commission on January 1, 1930, there were 87 grade crossings proceedings, and 268 projects for elimination were begun during the year; and 74 cases were still pending at the beginning of 1931. The program for 1931 includes 204 crossings, the estimated cost of the elimination of which is over



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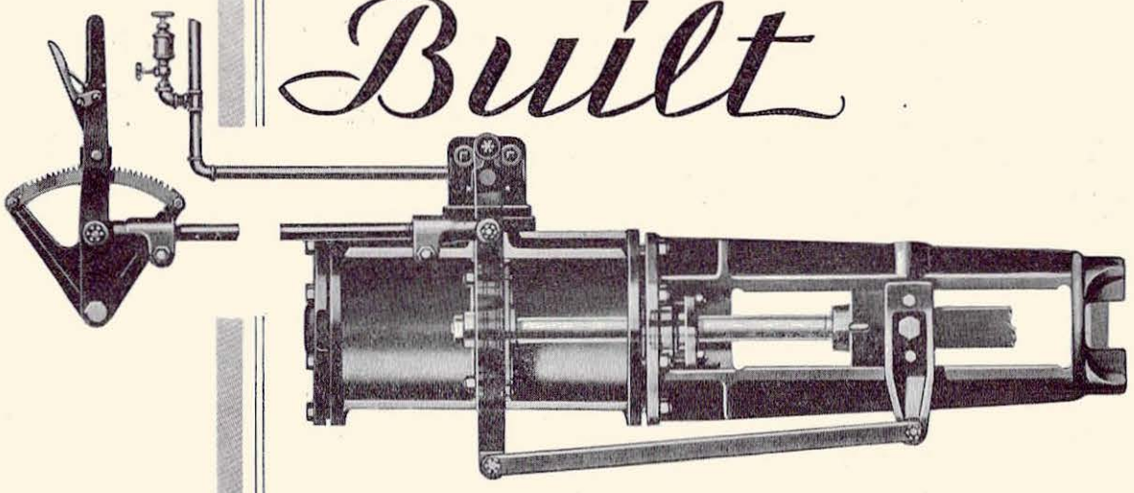
Alco Built



REVERSE gears are rapidly becoming recognized as essential equipment. But the growing demand for the Alco Reverse Gear in particular goes farther back than that.

To measure up to the needs of today for a fast, flexible and dependable gear for any service is the central idea around which Alco reverse gears are built. It serves acceptably in heavy freight service and responds equally well to the needs of high speed passenger requirements. Again, in fast freight, helper and switching service it gives quick and accurate valve gear adjustment.

With low initial cost, its simple and interchangeable construction eliminates expensive repair parts throughout a long service life.

In short, that extra measure of service which is inbuilt in every Alco product is fully embodied in Alco Reverse Gears.

American Locomotive Company
30 Church Street New York N. Y.

33 millions. This program includes costly changes in Buffalo and in Syracuse.

Since July 1, 1930, the commission has had a bureau to supervise the operation of motor vehicle lines, a chief inspector and six assistant inspectors. Much defective equipment has been found in operation; there has been noticeable improvement, but small business and poor financial structure necessitate the neglect of much desired improvements.

The report contains the usual statistics including a table of rail failures. In the year ending June 30, 1930, there were 3,203 failures, as compared with 2,757 for the preceding year. Failures due to transverse fissures numbered 886. It is noted that the Sperry car is used on several railroads to detect the presence of fissures, but the solution of the problem is no nearer than before.

Club Meetings

W. B. Storey, president of the Atchison, Topeka & Santa Fe, spoke on "Railroad Problems of 1931" at a meeting of the Industrial Club of St. Louis on February 12.

Edward F. Flynn, assistant to the vice-president of the Great Northern, was the principal speaker at a banquet given by the Birmingham, Ala., Traffic and Transportation Club on February 12.

Ralph Budd, president of the Great Northern, spoke on "Some Impressions of Russia" at a luncheon given by the Traffic Club of Chicago on February 19.

A. H. Rudd, chief signal engineer of the Pennsylvania, was the speaker at the meeting of the New York Railroad Club held in New York City on February 20. Mr. Rudd's address entitled "The Cab Signal," was followed by motion pictures.

The Railway Club of Pittsburgh (Pa.) will hold its next meeting on Thursday evening, February 26, at the Fort Pitt Hotel. A. I. Lipetz of the American Locomotive Company will speak on Evolution of the Steam Locomotive. There will be a dinner at the hotel preceding the meeting.

The New England Railroad Club will hold its next meeting at the Copley Plaza Hotel, Boston, on Tuesday, March 10, at 6:30 p. m. Dr. James Aston of the A. M. Byers Company will give an address, with motion pictures, on the manufacture of the Byers new process iron. The annual election of officers will take place at this meeting.

Overproduction of Transportation

"Overproduction, which the Federal government promoted with irrigation, reclamation and other projects, is frequently used to explain the present low level of agricultural prices, on which the same government is spending $500,000,000 and prodigious effort to lift, ostensibly to aid economic conditions by improving the buying power of the farm population. With this situation worrying us, should not the public examine to see whether the identical government isn't promoting another form of economic distress, equally bad, by an overproduction of transportation service?" asks Wallace T. Hughes, general attorney of the Chicago, Rock Island & Pacific.

The government, says Mr. Wallace, spent to June 30, 1929, a total of $1,555,870,849 on rivers, harbors, and canals. The expenditures are proceeding and eventually will mount to more billions. "Champions of interior waterways and barge lines fall into three main groups: (1) Local organizations, more concerned with civic pride than with economic matters, which desire their town to show on the map as a port; (2) shipping concerns, which are seriously in favor of the waterways, not because they prefer slow service, but because they expect such competition to force rail rates down; (3) contractors and dealers in materials, for whom such projects afford profitable opportunities.

"The proposed waterway system is planned to supply transportation for territory already served by railroads and divert tonnage from the latter, whose need is more, not less, traffic. Since the railroads today and for years to come can furnish more transportation than the country is consuming, these additional facilities are not essential to commerce. They are merely surplus facilities, sharing with the rails a fixed volume of tonnage. The outcome will be an overproduction of transportation service, which recent experiences with overproduction in other fields should warn us against.

"Available statistics show that for the first ten months of 1930, the railroads spent $1,087,616,000 for fuel, lumber and other materials and for operating expenses $3,378,874,379. This last due to enforced retrenchment, was $445,532,252 less than was spent in the corresponding period of 1929.

"With one arm trying to strengthen agriculture, the government is with the other trying to weaken a great $25,000,000,000 industry which is the largest employer of labor and whose prosperity is not less essential. People who demand waterways, barge lines and reduced rates don't seem to realize that they are fighting one of the sources of their own prosperity."

Harvard Business School Outlines 1931 Summer Railroad Course

The outline of the course in railway transportation, to be given at the 1931 special summer session for business executives at Harvard Business School, has recently been issued. These transportation courses, as announced in the *Railway Age* of January 31, page 304, are conducted by William J. Cunningham, James J. Hill Professor of Transportation, Harvard University, and Winthrop M. Daniels, Thomas DeWitt Cuyler Professor of Transportation, Yale University.

The outline of the two sections of the course is as follows.

ADMINISTRATIVE SECTION

Organization
(Professor Cunningham)

The beginnings of a railroad; economic justification; legal requirements; preliminary organization.
Financial organization.
Economics of location.
General principles of official organization.
Survey of departmental relationships.
Problems of executive control.
The operating and maintenance departments.
The traffic department.
The accounting department.
Railroad labor organizations.
Relations between management and employees.
Comparisons with organization of foreign railroads.

Operation and Maintenance
Economics of maintenance of way.
Economics of maintenance of equipment.
Utilization of locomotives.
Utilization of freight cars
Utilization of passenger cars.
Utilization of work equipment.
Station design and operation—passenger.
Station design and operation—freight.
Terminal design and operation.
Classification yards.
Standard code of train rules.
Freight train operation.
Passenger train operation.
Train accidents.
Signaling—discussion of types.
Signaling—economy of

Accounting and Statistics
Governmental control.
Development of classifications.
Income account, Profit and Loss account, Balance Sheet.
Revenue and Station accounting.
Disbursement accounting; classification of operating expenses.
Depreciation accounting.
Separation of expenses between classes of service.
Determination of cost of service.
Statistical indices—general.
The operating ratio.
Statistics of maintenance.
Statistics of station and yard operation.
Statistics of train operation.
Budgetary control.
Specific costing problems.

SECTION ON RATES AND REGULATION
(Professor Daniels)

1. The fundamental economic significance of transportation.
2. Development of railway transportation in the United States.
3. General Principles underlying Rates.
4. Survey and General Outline of territorial rate structures.
5. Genesis, legal background and growth of governmental regulation.
6. Survey of Federal Legislation. The orginal Act of 1887; its weakness: subsequent amendments, 1906, 1910, 1914, 1917. The Transportation Act of 1920: proposed amendments.
7. Valuation and recapture.
8. Consolidation.
9. Financial Structure and related Problems.
10. The Operation and Functioning of the Interstate Commerce Commission.

The transportation course at the 1930 session was attended by 22 students, including 21 representatives of eight American railroads and one foreign railway. The Boston & Maine led with six representatives while the Chesapeake & Ohio and the Baltimore & Ohio ranked second with four each.

Hearings on Pipe Line Bill

The House committee on interstate and foreign commerce held hearings on February 17 and 18 on the bill introduced by Representative Hoch, of Kansas, to prohibit pipe lines from transporting products in which they are interested by making the commodities clause of the interstate commerce act apply to common carriers instead of only to railroads. Representatives of independent oil interests testified in support of the bill, apparently on the theory that if they could divorce pipe lines from the control of the big oil companies they might find more competition in the marketing of their product. The committee had requested a report on the bill from the Interstate Commerce Commission, and Commissioner Eastman submitted one for its legislative committee saying it felt unable at this time either to oppose or to approve what is sought to be accomplished in the bill. It was pointed out, however, that some of the language in the commodities clause is inapplicable in connection with certain kinds of carriers other than railroads and also the suggestion was made that if the committee should reach the conclusion that its appli-

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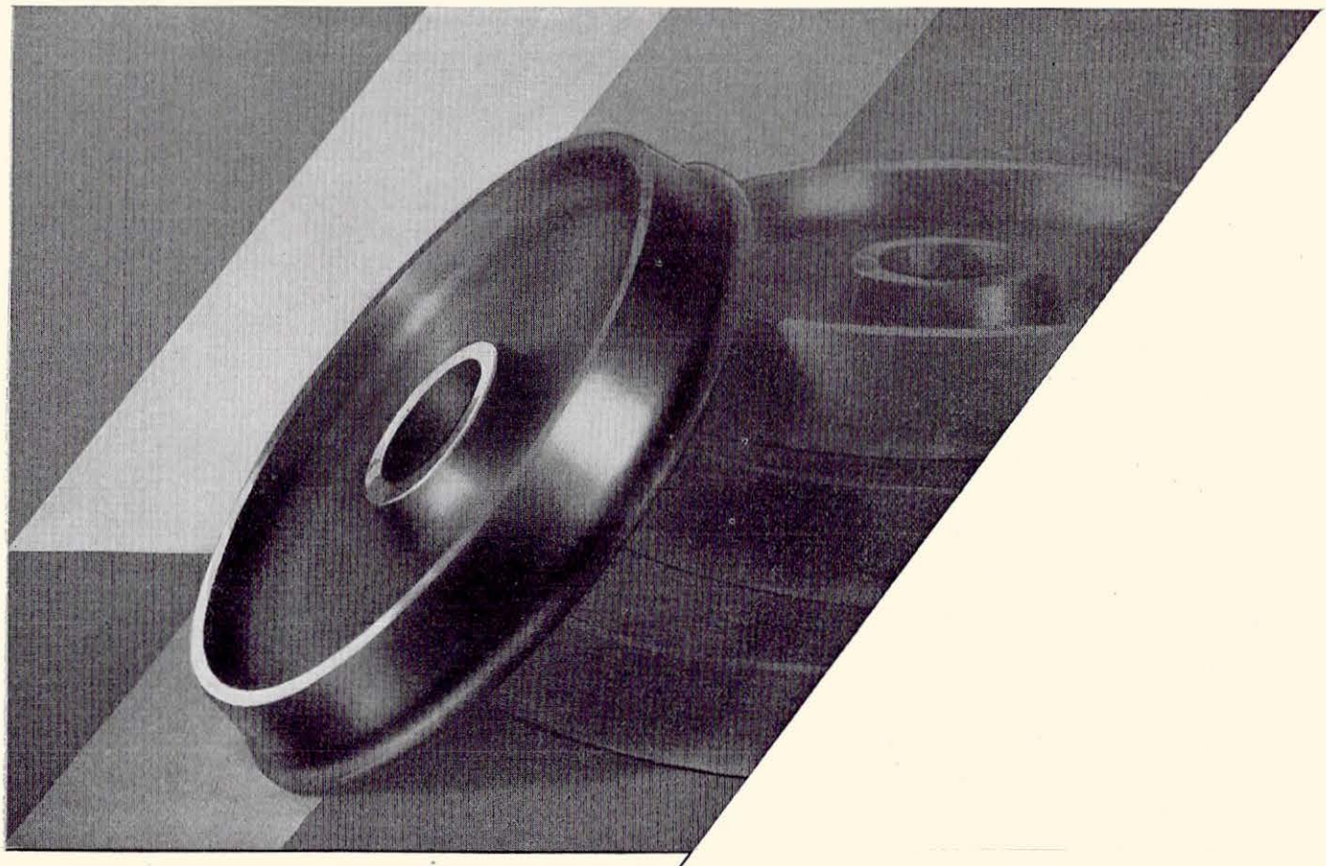

MODERN WHEELS FOR MODERN SERVICE

The high speed of modern transportation by rail demands rigorous safety measures which must include, in addition to efficient signal systems, the use of adequate materials in rolling stock and maintenance of way. The use of suitable wheels is particularly important, for here is the focal point of safety. Upon wheels rests the major share of responsibility.

In passenger service, where naturally the greatest safety precautions are taken, Carnegie Wrought Steel Wheels have long been recognized as the standard of excellence. Carnegie Light Weight Wrought Steel Wheels—made by the same process and of the same quality of steel—bring to freight service a similar measure of protection at minimum cost.

To serve even more efficiently, we are now prepared to furnish Rim-Toughened Wrought Steel Wheels for all classes of service. The process of heat treatment to which these wheels are subjected insures additional service out of all proportion to the small increase in cost. Carnegie Wheel engineers are at your service.

U S STEEL

CARNEGIE WROUGHT STEEL WHEELS

Product of Carnegie Steel Company, Pittsburgh, Pa., Subsidiary of United States Steel Corporation 121

cation should be extended to other carriers occasion should be taken to perfect the wording of the clause.

"Question has arisen," Commissioner Eastman said, "as to whether the clause, as it is now worded, applies not only to situations where a railroad company controls or is financially interested in an industry whose product is shipped over its rails, but also to situations where the industry controls or is under common control with the railroad company. It has been urged that it does not apply to the latter situations and that the Supreme Court has not so held. Without conceding the validity of this argument, it does appear that the wording of the clause could be bettered, so that this question would not arise." For this purpose a suggestion was made as to changes in the commodity clause to include products "produced by or under the authority of a company which directly or indirectly controls or is under common control with such carrier." This question has arisen in a suit which the Department of Justice has brought against the Elgin, Joliet & Eastern because it carries products of the steel company that controls the railroad.

Equipment and Supplies

FREIGHT CARS

E. H. Wilson & Company, Philadelphia, Pa., are inquiring for 20 to 30 all-steel gondola cars of 40, 50 and 70 tons' capacity.

The Freedom Oil Works Company has ordered seven tank cars from the Standard Tank Car Company. Inquiry for this equipment was reported in the *Railway Age* of December 27.

PASSENGER CARS

The Kansas City Southern is inquiring for four baggage and mail cars.

The Baltimore & Ohio is inquiring for five baggage and mail oil-electric rail motor cars.

IRON & STEEL

The Seaboard Air Line has ordered 5,000 tons of rails from the Tennessee Coal, Iron & Railroad Company.

SIGNALING

The Canadian National has ordered from the Union Switch & Signal Company material for the installation of centralized traffic control on the new cut-off at Brantford, Ontario, single track. The A.P.B. block signal system will be installed on 3½ miles of line, which line, together with the switches at the two ends of the cut-off, will be controlled from the tower at Paris Junction, six miles away from the signalled territory. The order includes 15 searchlight signals, seven dual-control electric switch movements and other apparatus.

Revenues and Expenses of Railways

Month of December and Twelve Months of Calendar Year 1929

Name of road		Av. mileage operated during period.	Operating revenues			Operating expenses						Net from railway operation.	Operating income (or loss).	Net ry. operating income.	Net ry. operating income, 1929.
			Freight.	Passenger.	Total (inc. misc.)	Maintenance of Way and structures.	Maintenance of Equip. ment.	Traffic.	Trans-portation.	General.	Total.	Operating ratio.			
Duluth, Winnipeg & Pacific	Dec.	178	$87,330	$10,100	$106,275	$15,134	$37,635	Cr. $669	$60,153	$7,026	$120,277	113.2	—$14,002	—$15,434	—$4,893	$3,984
	12 mos.	178	1,504,031	130,071	1,753,392	321,452	441,341	53,959	770,584	89,024	1,711,277	97.6	42,115	—43,466	21,688	271,525
Florida East Coast	Dec.	863	605,777	202,736	1,044,508	72,739	184,514	34,819	297,448	37,010	622,862	59.6	421,646	349,923	291,886	234,405
	12 mos.	863	6,575,008	3,479,031	11,729,811	1,732,509	2,238,776	362,651	3,574,295	534,588	8,614,295	73.4	3,115,606	1,778,349	1,040,154	1,637,961
New York Connecting	Dec.	20	167,659	.....	191,384	16,907	4,359	.....	32,025	1,125	54,416	28.4	136,968	102,410	81,803	113,694
	12 mos.	20	2,209,751	.....	2,517,279	227,551	128,928	.....	408,008	19,140	783,627	31.1	1,733,652	1,303,341	993,704	1,260,858
Seaboard Air Line	Dec.	4,481	3,075,607	517,771	3,995,184	657,792	837,089	160,605	1,517,365	165,863	3,268,922	81.8	726,262	621,370	485,027	1,069,322
	12 mos	4,495	39,188,861	5,723,696	49,677,049	6,947,197	9,325,429	2,338,123	18,476,076	2,024,217	39,461,055	79.4	10,215,994	6,801,625	5,999,346	10,965,725
Union Pacific	Dec.	3,765	6,234,805	869,516	7,918,008	538,362	1,743,980	186,269	2,423,928	280,414	5,293,167	66.8	2,624,841	2,022,987	1,799,523	1,839,707
	12 mos.	3,765	86,521,719	12,305,458	108,345,285	10,268,868	21,843,148	2,200,350	30,942,968	3,950,426	71,068,502	65.6	37,276,783	29,609,045	25,560,511	29,721,493
Oregon Short Line	Dec.	2,531	2,045,209	223,586	2,490,734	278,059	428,286	51,893	835,638	109,242	1,763,984	70.8	726,750	561,780	468,191	440,203
	12 mos.	2,538	28,385,344	2,943,089	33,991,955	5,016,016	5,301,174	658,968	10,132,510	1,495,921	23,117,292	68.0	10,874,663	7,466,855	6,148,561	8,605,758
Oregon-Wash. R. R. & Nav. Co.	Dec.	2,337	1,310,021	190,387	1,694,772	236,859	304,286	70,365	708,918	109,759	1,456,831	86.0	237,941	178,156	90,088	363,375
	12 mos.	2,356	19,923,723	2,256,671	24,565,036	4,206,979	3,656,467	916,591	9,265,532	1,464,696	19,789,314	80.6	4,775,722	2,610,221	1,329,520	2,531,083
Los Angeles & Salt Lake	Dec.	1,227	1,245,987	252,076	1,675,866	226,721	328,276	74,270	570,044	72,675	1,316,148	78.5	359,718	205,986	100,115	185,331
	12 mos.	1,229	16,875,777	3,679,081	22,770,335	3,425,485	3,748,062	954,499	7,272,416	1,005,699	17,179,741	75.4	5,590,594	3,781,892	2,259,130	4,467,234
St. Joseph & Grand Island	Dec.	258	231,030	5,846	239,161	26,730	32,767	3,333	88,887	15,573	167,671	70.1	71,490	64,620	43,331	36,747
	12 mos.	258	3,397,788	85,395	3,604,258	500,871	430,135	40,496	1,199,090	199,836	2,384,017	66.1	1,220,241	992,846	690,950	767,570
Utah	Dec.	111	210,068	18	212,919	5,555	43,168	495	49,183	Cr. 159	98,180	46.1	114,739	91,053	75,577	68,780
	12 mos.	111	1,680,079	18	1,689,796	247,944	414,884	4,558	408,506	65,590	1,141,281	67.5	548,515	427,599	267,282	601,215

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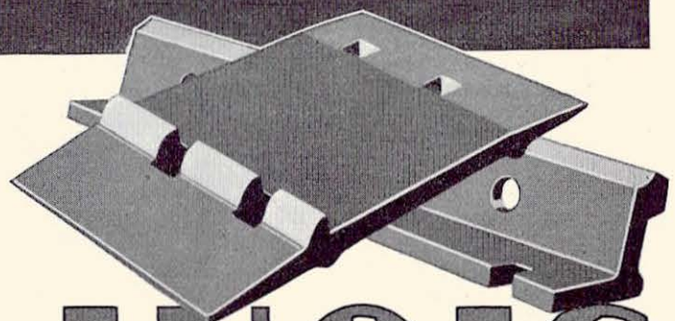
Uniformly Dependable



ILLINOIS

TIE PLATES AND ANGLE BARS

Illinois Steel Company
SUBSIDIARY OF UNITED STATES STEEL CORPORATION

208 South La Salle Street, Chicago, Illinois

Supply Trade

The Bucyrus-Erie Company, Milwaukee, Wis., has purchased a controlling interest in the **Monighan Manufacturing Company,** Chicago, and will operate the latter as a separate unit under the present management.

Eugene Brandeis, vice-president of the **Lundie Engineering Corporation,** New York, was elected president at a recent meeting of the board of directors, to succeed Dr. John Lundie, deceased. Mr Brandeis' headquarters are at New York. **L. B. Armstrong,** western manager, was elected vice-president with headquarters at Chicago.

Le Sauvage & Beardsley, Genesee building, Buffalo, N. Y., have been appointed direct representatives for Lo-Hed monorail electric hoists in the districts of Buffalo and Rochester by the manufacturers, the American Engineering Company, Philadelphia, Pa. Weed & Company will continue to distribute Lo-Heds in Buffalo and Rochester, cooperating with Le Sauvage & Beardsley.

R. C. Vilas, who has been associated with the **Pyle-National Company,** Chicago, since its incorporation in January 1899, and who has been president since 1908, has been elected chairman of the board and has been succeeded by **L. H. Vilas,** his brother. **William Miller,** vice-president, has been elected senior vice-president and **J. A. Amos,** vice-president, has been elected vice-president and general manager.

Augustus Wood, formerly chief engineer and works manager of the **Niles Tool Works,** Hamilton, Ohio, has returned to its service in the capacity of consulting engineer. During his absence from Hamilton, he has held the positions of works manager at the Putnam Machine Company, Fitchburg, Mass., and consulting engineer for the parent company, Manning, Maxwell & Moore. More recently he has been connected as consulting engineer with the Consolidated Machine Tool Corporation, Rochester, N. Y.

The election of executive officers by the **McClintic-Marshall Corporation** which was recently taken over by the Bethlehem Steel Corporation has been announced by **G. H. Blakeley,** the new president of McClintic-Marshall. The following were elected: **Edward A. Gibbs,** vice-president in charge of production, **Charles M. Denise,** vice-president in charge of sales and **E. J. Patterson,** vice-president and treasurer. All three have been with the McClintic-Marshall Corporation serving in similar capacities under the former management.

The Westinghouse Electric & Manufacturing Company has formed a railway engineering department at Pittsburgh, Pa., by grouping its railway equipment and railway motor engineering departments, its railway engineering division of its general engineering department, its traction and mining division of its control engineering department, its overhead line material section of its supply engineering department and its trolley design section of its gearing engineering department. **Frederick Urban,** assistant to the vice-president, has been placed in charge of the new department, and **Francis E. Wynne,** manager of the railway equipment engineering department, has been appointed assistant general manager. **Claude Bethel,** manager of the railway motor engineering division, has been appointed division engineer in charge of the equipment and control division, **Sidney B. Cooper,** manager of engineering in the general engineering department, has been appointed division engineer in charge of the project and motor division, **Lynn G. Riley,** assistant to the manager of the control engineering department, has been made assistant division engineer on control and **Lloyd J. Hibbard,** special engineer in general sales, has been appointed special engineer.

E. E. Yake, who has been appointed a vice-president of the **Worthington Pump & Machinery Corporation,** New York, will continue to direct the manufacturing and engineering divisions which were assigned to him in April, 1927. Mr. Yake was born at Annville, Pa., where he attended the public schools and at the age of 14 started work in a shoe factory. He subsequently attended business college and then entered the employ of the Pennsylvania Steel Company. He later attended Lehigh University from which

E. E. Yake

he was graduated in 1912 with the degree of mechanical engineer. After several years of office and secretarial work with the Pennsylvania Steel Company he was transferred to the production division. In 1915 he became associated with the Gilbert & Barker Company, Springfield, Mass. During 1920 and 1921 he was eastern manager for the C. & G. Cooper Company, Mt. Vernon, Ohio, with office at New York City and in the latter year went to Springfield to become works manager of the Gilbert & Barker plant from which he resigned in 1926 to enter the Worthington organization as assistant to the president. The following year he was assigned the duties of the manufacturing and engineering divisions and in August, 1928, was given the title of director of manufacturing and engineering.

H. C. Beaver, who has been appointed a vice-president of the **Worthington Pump & Machinery Corporation,** New York, has been identified with the engineering, manufacturing and sales of mechanical and electrical equipment for more than 30 years; he will devote his time principally to the administration of the sales department. Mr. Beaver was born in Pennsylvania and received his education in the public schools and Juniata College in Pennsylvania, and at Marquette University. He began work in the motive power department of the Pennsylvania at Pittsburgh. Later he joined the sales department of the Westinghouse Electric & Manufacturing Company becoming assistant to the sales manager in 1904. Two years later

H. C. Beaver

Mr. Beaver went to Milwaukee where he was appointed assistant to the president of the Allis-Chalmers Company. He subsequently served as general manager of the electrical works of the Allis-Chalmers Manufacturing Company, Cincinnati, Ohio. In 1912 he went to Springfield and became associated with the Stevens-Duryea Company in charge of its sales organization. Mr. Beaver became connected with the Rolls-Royce of America, Inc., Springfield, Mass., as treasurer in December, 1919, and several years later in addition to his duties as treasurer was elected vice-president in charge of engineering and manufacturing; he continues as a member of the board of directors of that company. Mr. Beaver is vice-president of the National Metal Trade Association.

Chicago Railway Equipment Company

The annual report of the Chicago Railway Equipment Company for 1930 shows undivided profits of $1,131,620 as compared with $1,129,273 in 1929. Of this amount, $199,172 was paid as dividends on the preferred stock and $59,936 on the common stock as compared with $14,984 in 1929.

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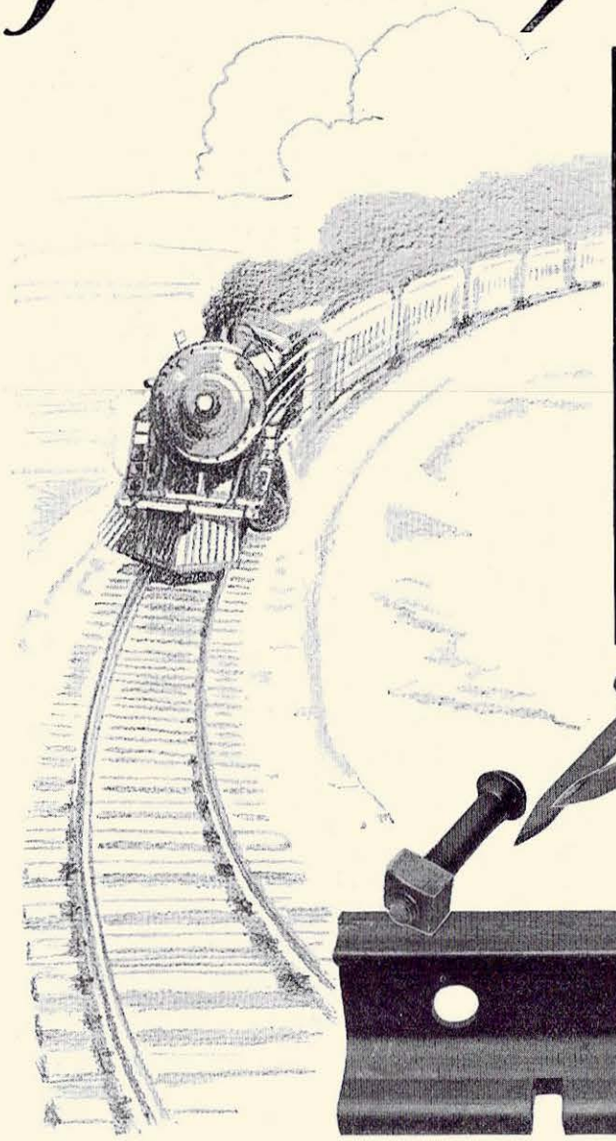
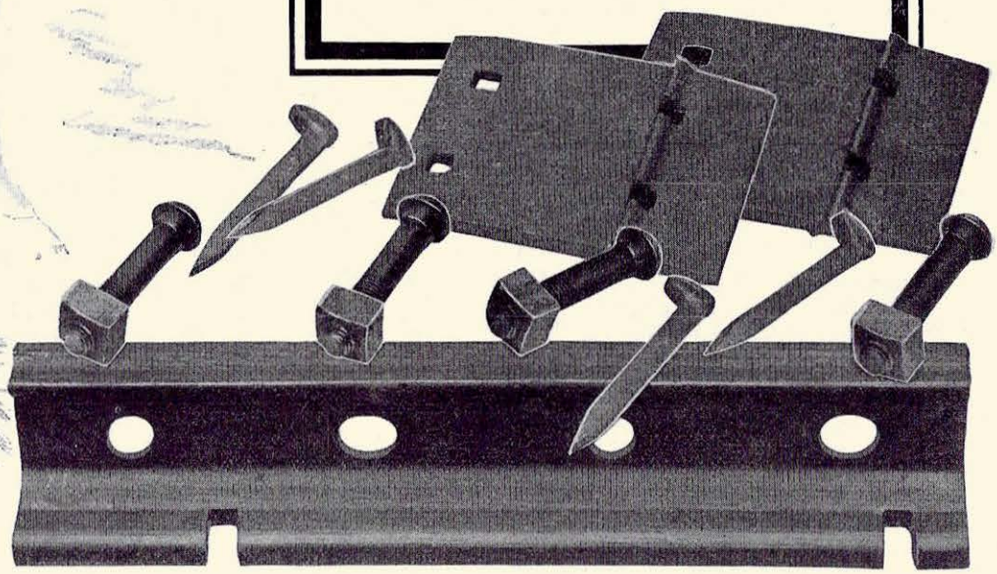
TENNESSEE
Track Materials
for Safety and Service



MODERN industry reveals few uses for steel where SAFETY plays the paramount part it does in track construction—and never has there been a time when SERVICE records were receiving more careful scrutiny than the present when every item must prove its worth through performance.

Tennessee Track Materials are produced by an organization of men and mills which for many years has supplied this class of steel in tremendous quantities to many of the country's foremost railroads. This vast experience enables us to unqualifiedly recommend these products of our manufacture for *Safety and Service*.



Tennessee Coal, Iron & Railroad Company

General Offices: Brown-Marx Building, Birmingham, Ala.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES

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CYCLONE FENCE COMPANY
FEDERAL SHIPB'LDG. & DRY DOCK CO.
ILLINOIS STEEL COMPANY
NATIONAL TUBE COMPANY
THE LORAIN STEEL COMPANY
TENNESSEE COAL, IRON & RAILROAD CO.
UNIVERSAL ATLAS CEMENT COMPANY

Pacific Coast Distributors—Columbia Steel Company, Russ Bldg., San Francisco, Calif.

Export Distributors—United States Steel Products Company, 30 Church St., New York, N.Y.

Construction

ATCHISON, TOPEKA & SANTA FE.—The California department of public works, division of highways, has applied to the state railroad commission for authority to construct a viaduct over the tracks of this railroad at Bradley, Cal., two miles east of Merced. The cost of this projected construction is estimated at $184,000, in which the state, county and railroad will participate.

CHESAPEAKE & OHIO.—This company has authorized the construction of an overhead crossing at Winchester Pike, to eliminate Little Hoods Creek grade crossing, Ashland, Ky., at an estimated cost of $128,900, and has awarded a contract to A. J. Saville, Inc., Richmond, Va., for the construction of an undergrade crossing at Magnolia street, Richmond. This latter project, authorization for which was reported in *Railway Age* of October 18, 1930, will cost about $25,550.

CHICAGO, BURLINGTON & QUINCY.—This company and the City of St. Louis (Mo.) have reached an agreement for the lengthening of the span of the railroad's viaduct over Riverview drive at Prospect Hill to allow the street to be widened from 60 ft. to 100 ft. It is estimated that the project will cost $101,000, of which half will be borne by the railroad and half by the city.

CHICAGO, ROCK ISLAND & PACIFIC-WABASH.—The St. Louis (Mo.) Board of Public Service receives bids until March 10 for the construction of stone railings on the bridges over the tracks of these companies on Grand drive, and Lindell and Union boulevards in Forest park at a cost of $25,000.

CINCINNATI UNION TERMINAL.—A contract has been let to the Hickey Brothers Construction Company, Cincinnati, Ohio, for the construction of retaining walls at Cincinnati, involving 2,900 cu. yd. of earth excavation and 3,900 cu. yd. of reinforced concrete, at a cost of about $62,000.

CITY OF BUFFALO.—The Public Service Commission of New York has advised the Grade Crossing and Terminal Station Commission of the City of Buffalo that it does not consider excessive the bid submitted by M. L. Rupp, in the amount of $96,192, for approach work on the diversion of Amherst and Tonawanda streets in connection with grade crossing eliminations in Buffalo. Smaller bids for additional work to be done by the city in connection with the various eliminations have also been approved by the Public Service Commission.

FORT WORTH & DENVER CITY.—A contract for the grading and placing of drainage culverts for the construction of the first 2.3 miles of the Childress (Tex.)-Pampa line of the Fort Worth & Denver Northern from Childress north has been awarded to Oran Speer, Alvord, Tex.

LOS ANGELES & SALT LAKE.—This company has applied to the Interstate Commerce Commission for authority to build a cut-off line of 10.079 miles at San Pedro, Los Angeles and Long Beach, Cal., and to abandon 2.26 miles of the San Pedro branch.

MISSOURI PACIFIC.—Bids will be received until February 24 for the construction of the superstructure of the 2,500,000-bu. reinforced concrete grain elevator under construction at Kansas City, Mo., and which when completed will be leased to the Continental Export Company, St. Louis, Mo.

NEW YORK CENTRAL.—This company has applied to the city of Gary (Ind.) for the vacation of streets and alleys in a 100-acre tract on the west side of the city which will be used for the construction of a freight yard involving an ultimate expenditure of about $10,000,000.

PENNSYLVANIA.—A contract has been awarded to the Stillman-Delehanty-Ferris Company, Jersey City, N. J., in the amount of $97,700, for the removal of old bridges Nos. 4.21 and 4.25 over the Hackensack river at Marion, N. J. As reported in the *Railway Age* of November 8, 1930, page 999, these structures were recently replaced by new bridges for freight and passenger service.

TEXAS & PACIFIC.—A contract has been awarded to Allhands & Davis, Joplin, Mo., for the construction of an earthen dam across Big Aguja canyon in the Davis mountains, Jeff Davis county, Tex., near Toyah, to provide a reservoir for water supply. The cost of this project will be about $70,000 and involves the placing of 60,000 cu. yd. of embankment, 12,000 cu. yd. of solid rock spillway excavation, 175 cu. yd. of plain concrete and 420 cu. yd. of reinforced concrete. A contract has been let to the H. K. McCollum Construction Company, Fort Worth, Tex., for the construction of a highway subway under the tracks of this company at Main street, Fort Worth.

THE COLORADO PUBLIC UTILITIES COMMISSION has granted the Colorado & Southern permission to operate tri-weekly train service, instead of daily, on its Denver-Leadville line, 151 miles. With this arrangement, it is expected that the loss of $38,000 a year will be cut down to $8,000.

THE NEW YORK CENTRAL has opened a new commissary for its dining cars at the New York Terminal, which is described as one of the largest and most modern establishments of its kind in the world. It is in the Melrose Central Building, 161st street and Morris avenue, which is at the northern end of the passenger car yard, Mott Haven, five miles from the Grand Central Terminal. The whole building, 13 stories high, is occupied by the New York Central and the Pullman Company. The building fronts 166 ft. on Morris avenue and 185 ft. on 161st street. The greater part of the track-level floor, which is two stories below the sidewalk, is occupied by the dining car commissary. Twenty-six cars can be serviced in one hour.

Financial

ATCHISON, TOPEKA & SANTA FE.—*Bond.*—The Interstate Commerce Commission has authorized the Grand Canyon to issue a first mortgage 6 per cent, series B, bond for $700,000 to be delivered to the Santa Fe in satisfaction of indebtedness.

BALTIMORE & OHIO.—*Bonds.*—This company has sold, without public offering, $35,000,000 of 4 per cent unsecured notes, to mature August, 1932. This issue is in part a renewal of short time obligations outstanding on account of Chicago & Alton bond purchases, and for partial reimbursement of its treasury for other capital investments.

BATESVILLE SOUTHWESTERN. — *Abandonment.*—The Interstate Commerce Commission has authorized the estate of R. J. Darnell and this company to abandon, as to interstate and foreign commerce, the line of railroad extending from Batesville, Miss., southward to Crowder, 16.9 miles.

BOSTON & MAINE.—*Final Valuation.*—The final value for rate-making purposes of the properties used by the Boston & Maine system for common-carrier purposes as of 1914 was placed at $230,894,738, in the final valuation report issued by the Interstate Commerce Commission. The value of the property owned and used was placed at $95,600,000 and that of the property used but not owned at $130,387,-395. The book investment was $90,653,840.

DENVER & RIO GRANDE WESTERN.—*Abandonment.*—Examiner M. S. Jameson of the Interstate Commerce Commission has recommended in a proposed report that this company be authorized to abandon a branch line from Taos Junction to La Madera, N. M., 16.43 miles.

DETROIT, TOLEDO & IRONTON.—*Realignment of Corporate Structure.*—This company, control of which was acquired in 1929 by the Pennroad Corporation from Henry Ford and associates, has applied to the Interstate Commerce Commission for authority to acquire the stock and properties of the Detroit & Ironton and the Toledo Detroit and to realign the corporate structure by issuing its own stock and creating a new first and refunding mortgage for the purpose of retiring the first mortgage bonds of the D. & I., the adjustment mortgage bonds of the D. T. & I., and the outstanding preferred stock of the latter. The authorized common stock of the D. T. & I. is to be increased to $25,000,000 and authority is asked to issue 44,722 shares in exchange for a like amount of shares of the D. & I., and its property; 75,714 shares in exchange for the adjustment mortgage bonds of the D. T. & I., and 59,900 shares in exchange for the outstanding preferred stock of the D. T. & I. Authority is also asked for the issuance of $10,776,000 of first and refunding mortgage bonds to be exchanged for a like amount of the first and refunding bonds of the D. & I.

MAINE CENTRAL.—*Final Valuation.*—The Interstate Commerce Commission has

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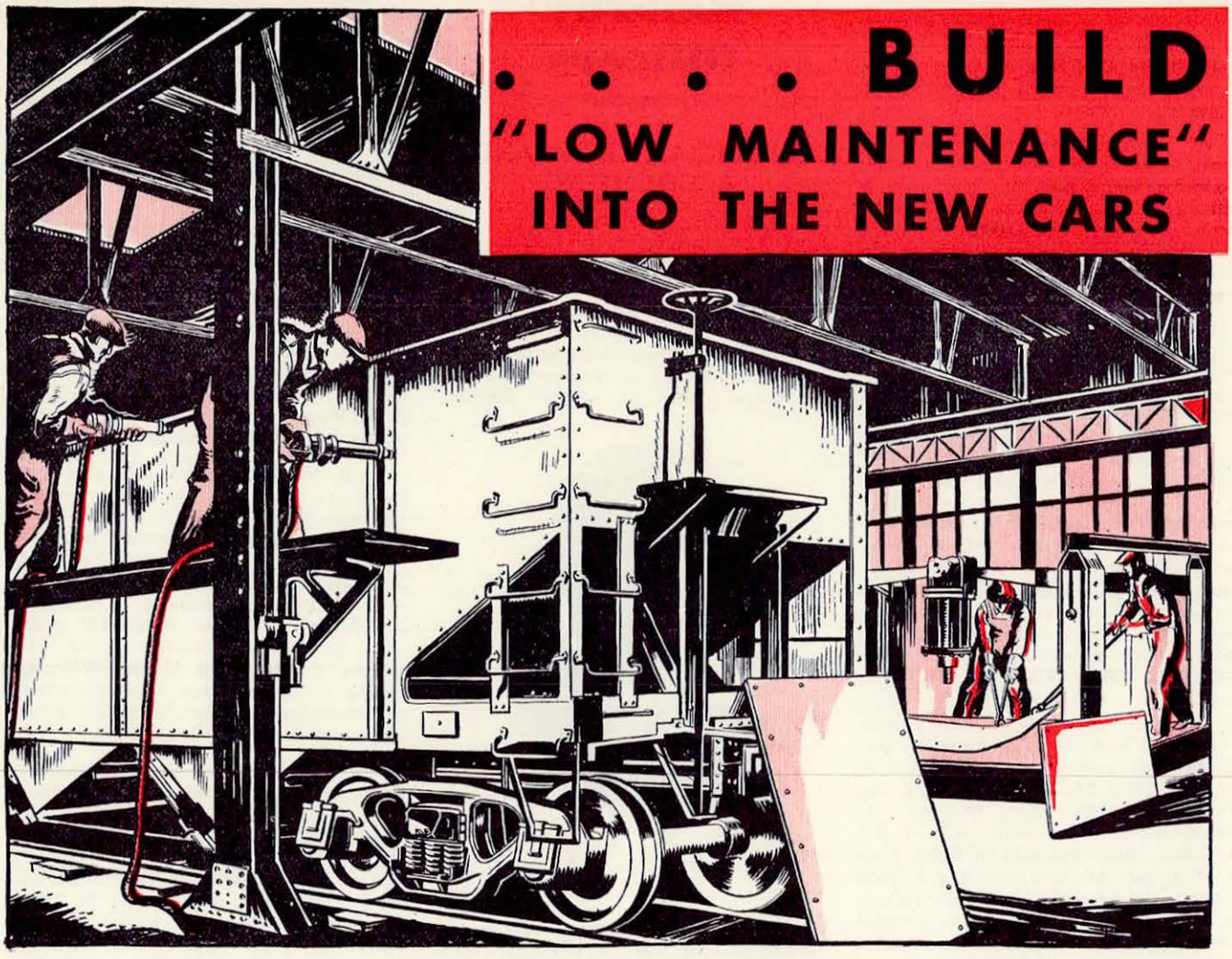

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Let TONCAN IRON Protect Them Against Rust and Corrosion . . .

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- Many miles of freight cars built of Toncan Iron plates are enjoying lower maintenance due to the superior rust resistance of this modern iron.
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- Build your new cars of it and cut down on repairs.

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Central Alloy Division

REPUBLIC STEEL CORPORATION

Youngstown, Ohio

found the final value for rate-making purposes of the property owned and used for common-carrier purposes, as of 1916, to be $40,681,062, while that of the property used but not owned was placed at $16,959,603.

NEW YORK CENTRAL. — *Bonds.* — This company has applied to the Interstate Commerce Commission for authority to sell to J. P. Morgan & Co., at 100½ and interest an issue of $4,000,000 of refunding and improvement mortgage bonds of the Michigan Central for which authority to issue was recently asked.

PENNSYLVANIA. — *Bonds.* — The Interstate Commerce Commission has authorized this company to assume obligation and liability for $11,301,000 of general mortgage, 4½ per cent, series C, bonds of the Philadelphia, Baltimore & Washington, maturing in 1977. The issue is authorized for sale to Kuhn, Loeb & Co. at par. The company has also been authorized to assume obligation and liability for $1,485,000 of 4½ per cent, series D, bonds of the Pittsburgh, Youngstown & Ashtabula. The issue will mature in 1977 and has been sold to Kuhn, Loeb & Co at 98½, which will make the cost to the railroad approximately 4.85 per cent. Other issues for which the company is authorized to assume obligation and liability and to sell are: $6,020,000, United New Jersey Railroad & Canal, 4½ per cent general mortgage, maturing in 1979; and $2,032,000 of Connecting Railway first mortgage, 4½ per cent bonds, maturing in 1951. The U.N.J. R.R. & C. issue was sold to Kuhn, Loeb & Co. at par and the Connecting Railway issue to the same banker at 99, making the average annual cost to the railroad 4.57 per cent.

ST. LOUIS-SAN FRANCISCO.—*Securities.*—The Interstate Commerce Commission has authorized this company to issue and renew from time to time $9,000,000 of promissory notes and to pledge as collateral security, at a ratio not exceeding $110 of bonds for $100 of notes, $7,700,000 of its first terminal and unifying mortgage bonds and $2,408,000 of a new issue of these bonds.

WESTERN MARYLAND.—*Final Valuation.*—The Interstate Commerce Commission's final valuation report, as of 1919, finds the final value for rate-making purposes of the property owned and used for common-carrier purposes to be $72,019,111, and that of the property used but not owned to be $2,959,538. The book investment in road and equipment was $127,143,001.

Dividends Declared

Cleveland & Pittsburgh.—Guaranteed, $.87½, quarterly; Special guaranteed, $.50, quarterly, both payable March 2 to holders of record February 10.

Pittsburgh, Youngstown & Ashtabula.—Preferred, 1¾ per cent, quarterly, payable March 2 to holders of record February 20.

Union Pacific.—Common, $2.50, quarterly; Preferred, $2.00, semi-annually, both payable April 1 to holders of record March 2.

Average Prices of Stocks and of Bonds

	Feb. 17	Last week	Last year
Average price of 20 representative railway stocks.	94.12	95.65	136.32
Average price of 20 representative railway bonds..	94.06	94.28	92.44

Railway Officers

FINANCIAL, LEGAL AND ACCOUNTING

A. F. Bayfield, newly-appointed comptroller of the Lehigh Valley, was born on June 13, 1878, at Liverpool, England. He is a graduate of Liverpool College, class of 1897, and Northwestern University School of Commerce, Chicago, Ill., class of 1914. While studying at Northwestern University he was employed as bookkeeper with the Illinois Central,

A. F. Bayfield

commencing his railroad career in the service of that road in 1906. In 1914, he was advanced to general accountant of the I. C., in which capacity he served until 1918, when he became connected with the Lehigh Valley as corporate auditor. In 1920, he was advanced to assistant comptroller, and in 1921, was appointed treasurer, the position he held until his recent appointment.

D. G. Baird, who, effective February 1, was appointed treasurer of the Lehigh Valley, in addition to serving as secretary, as announced in *Railway Age* of January 31, page 308, was born at Woodlawn, Cecil County, Md., and received a public school and business college education. He entered railroad service in 1873, as a bookkeeper with the Lehigh Valley, and has been in the continuous service of that road to date, serving successively as assistant cashier, assistant to vice-president, assistant secretary and secretary, the latter of which positions he still retains, in addition to his new duties as treasurer.

D. G. Baird

OPERATING

L. W. Wolcott has been appointed assistant trainmaster of the Logansport division of the Pennsylvania, succeeding **B. R. Mayer,** who has been transferred to the Indianapolis division.

K. R. Vought, superintendent of the Baltimore division of the Pennsylvania, has been granted leave of absence due to illness and **J. G. Sheaffer,** superintendent of the Ft. Wayne division has been transferred in the same capacity to the Baltimore division. **J. H. Cooper,** superintendent of the Schuylkill division, has been transferred to the Ft. Wayne division, and **H. E. Wolcott,** freight trainmaster, has been appointed superintendent of the Schuylkill division succeeding Mr. Cooper.

The jurisdiction of **C. E. Maxfield,** superintendent of the Cleveland division of the New York, Chicago & St. Louis, has been extended to include the Buffalo division, following the resignation of **E. J. Parrish,** superintendent of the latter division, on February 15. Mr. Maxfield's headquarters have been removed from Cleveland, Ohio, to Conneaut, Ohio. **P. L. Peffer** and **C. H. Lee** have been appointed assistant superintendents of the Buffalo and Cleveland divisions, with headquarters at Buffalo, N. Y., and Cleveland respectively. The jurisdiction of **F. A. Brown,** trainmaster of the Buffalo division, has been extended to include the Cleveland division, with headquarters at Conneaut, succeeding **J. M. Crouch,** who has been assigned to other duties. The positions of terminal trainmaster at Buffalo and Cleveland have been abolished.

TRAFFIC

M. A. Carroll, traveling freight agent for the Wabash at Atlanta, Ga., has been promoted to general agent at Phoenix, Ariz.

William B. Carlile has been appointed general development officer of the Chicago Great Western, with headquarters at Chicago. **G. E. Blaul** has been appointed general livestock agent, with headquarters at South St. Paul, Minn.

Effective February 16, **B. L. Birkholz,** assistant general agent of the Southern Pacific, was appointed general agent, freight department, with headquarters at New York City.

C. B. Andrews, district passenger agent of the Canadian Pacific, with

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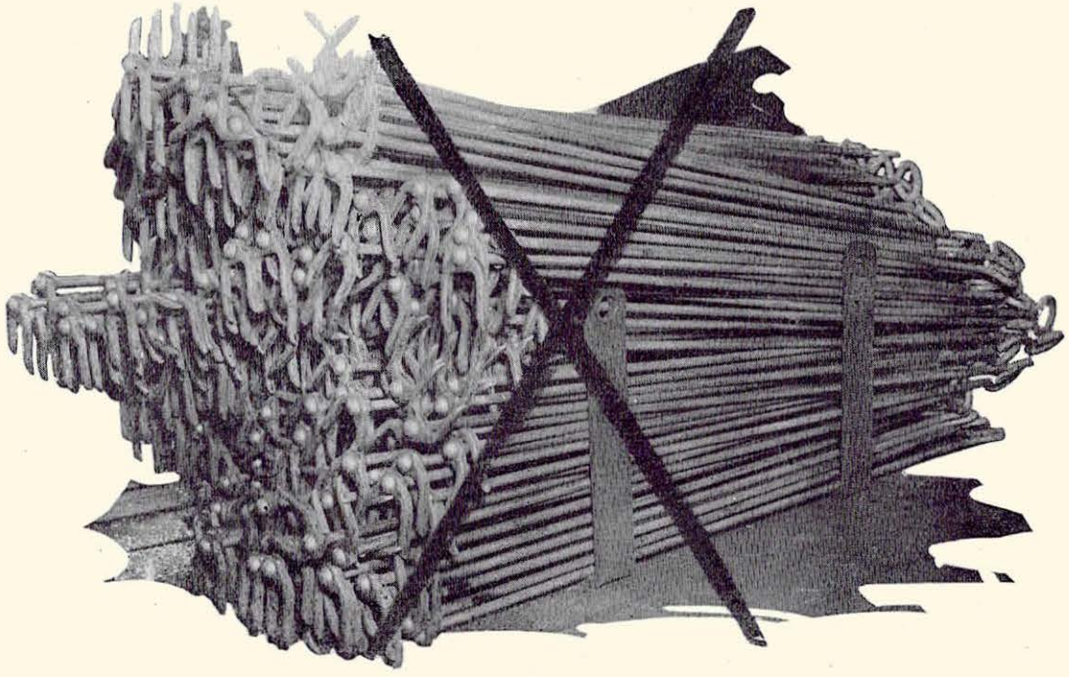

Hooks and Rakes

are going out of style on FIREBAR equipped locomotives.

Divisions are covered without the hooks and rakes being used. It must be that

BETTER FIRES

are responsible.

FIREBAR CORPORATION
CLEVELAND OHIO

headquarters at Winnipeg, Man., has been appointed passenger agent for the Maritime district, succeeding **George S. Beer**, who has been granted a leave of absence.

Alexander Tinling, assistant to the vice-president in charge of traffic of the Northern Pacific, with headquarters at St. Paul, Minn., retired from active duty on February 1. He was born at Waterloo, Ont., on January 31, 1861, and obtained his first railroad experience in 1882 as a clerk on the Northern Pacific at Glendive, Mont. Later he served successively as station agent at Forsythe, Mont., Glendive, Bozeman, Missoula and Helena and Spokane, Wash., and in 1888 he was appointed livestock agent. In 1893 he became general agent at Spokane and from 1911 until his retirement he served successively as general freight agent at Tacoma, Wash., Spokane and Seattle, assistant general freight agent at St. Paul, assistant freight and passenger agent at Tacoma, assistant general freight agent and general freight agent at Seattle and assistant to the vice-president at St. Paul.

ENGINEERING AND SIGNALING

R. D. Moore, assistant signal engineer of the Southern Pacific, has been promoted to signal engineer, with headquarters as before at San Francisco,

R. D. Moore

Cal., succeeding **W. E. Boland**, who resigned on February 7 to engage in private business.

Mr. Moore entered the service of the Southern Pacific as a signal apprentice in January, 1900, being advanced to signalman on the San Joaquin division in 1904. He was promoted to district signal foreman on the same division in 1905, then serving from 1907 to 1918 as signal supervisor on the Shasta, Sacramento and Los Angeles divisions. On November 1 of the latter year he was promoted to assistant signal engineer, with headquarters at San Francisco, his further promotion to signal engineer on the Southern Pacific becoming effective on February 7.

Mr. Boland has completed 34 years of service with the Southern Pacific. He was born at Greenville, Cal., on July 30, 1879, and after graduating from high school obtained his first railway experience as a signal apprentice on the Southern Pacific at the age of 17 years. Four

W. E. Boland

years later he was advanced to signal foreman, then being appointed division signal foreman in 1903. In 1904 he was promoted to signal supervisor, and in 1906 he was further promoted to assistant signal engineer, with headquarters at San Francisco. Mr. Boland was promoted to signal engineer in 1914.

OBITUARY

William G. Wescoat, who had been given a leave of absence from his position as assistant general freight agent of the Wabash at St. Louis, Mo., in June, 1930, because of ill health, died at his home at University City, Mo., on February 5.

George H. Nickerson, chief engineer of the Yosemite Valley, with headquarters at Merced, Cal., died in a hospital at San Francisco, Cal., on January 15, following a major operation. Mr. Nickerson was born at Lebanon, Ore., on March 23, 1863, and entered railway service in April, 1884, as a rodman on the Oregon Pacific (now part of the Southern Pacific). Later he served as a roadmaster and division engineer on the Union Pacific, then becoming division road master on the Gulf, Colorado & Sante Fe at Cleburne, Tex., and general foreman of bridges and buildings on the Atchison, Topeka & Santa Fe at Fresno, Cal. In November, 1906, he was appointed chief engineer of the Yosemite Valley at Merced, where he remained until October, 1917, when he resigned to enter private practice as a civil engineer. Mr. Nickerson re-entered the service of the Yosemite Valley as chief engineer on January 1, 1922, a position he occupied until his death.

Benjamin C. Prince, freight traffic manager of the Seaboard Air Line, with headquarters at Norfolk, Va., died suddenly of a heart attack at Philadelphia, Pa., on February 11. Mr. Prince was born at Americus, Ga., on August 17, 1877, and received his education at Kentucky University, Lexington, Ky. He entered railway service in September, 1891, as junior clerk to the auditor of the Savannah, Americus & Montgomery (now part of the S. A. L.) at Americus, Ga. From 1896 to 1897, he served in the general freight agent's office of the Central of Georgia at Savannah, Ga. In 1897, he became chief clerk to the traffic manager of the Florida East Coast at St. Augustine, Fla., and, in 1901, was appointed chief clerk to division freight and passenger agent of the Central of Georgia at Chattanooga, Tenn. In 1906 he became commercial agent at Atlanta, Ga., and from 1907 to 1911, was traffic manager of the Georgia, Florida & Alabama at Bainbridge, Ga. In 1911, he was appointed assistant general freight agent of the S. A. L. at Jacksonville, Fla. From 1914 to 1918, he served as assistant to first vice-president with headquarters at Norfolk, Va., and during the period of Federal control, 1918 to 1920, he served as assistant traffic manager of the S. A. L. In 1920, he was appointed freight traffic manager, the position he held until his death.

Frank E. Webster, general freight agent of the Chicago & Eastern Illinois, with headquarters at Chicago, died in that city on February 11 after an illness of two weeks. Mr. Webster was born in Charles county, Md., on July 9, 1879, and entered railway service in 1902 as a file clerk in the accounting and claim department of the Southern at Washington, D. C. In the following year he became revision clerk in the freight department of the Chicago, Rock Island & Pacific at Chicago, then entering the service of the Chicago & Eastern Illinois in 1904 as a rate clerk in the traffic department. He was advanced to chief rate clerk in 1905, where he remained until 1908 when he was appointed assistant to the general traffic manager of the Illinois Traction System (now part of the Illinois Terminal System), at Springfield, Ill. In 1909 Mr. Webster was appointed traveling freight agent for the C. & E. I.-Frisco-Rock Island lines at Nashville, Tenn., later being transferred to Milwaukee, Wis., and to Minneapolis, Minn., for the C. & E. I.-Frisco lines when the Rock Island was separated from them. He then served successively as chief clerk in the general freight office of the C. & E. I. at Chicago, chief clerk to the freight traffic manager of the C. & E. I.-Frisco lines at St. Louis, Mo., division freight agent on the C. & E. I. at Salem, Ill., chief of the tariff bureau of the same road at Chicago and assistant general freight agent at the latter point. During the World War he served for about a year in charge of the forage branch of the Inland Traffic Service at Chicago. Mr. Webster had been general freight agent of the Chicago & Eastern Illinois since August 15, 1925.

Richard Montfort, consulting engineer of the Louisville & Nashville, with headquarters at Louisville, Ky., who died at Atlantic City, N. J., on February 7, had been in the service of that company for

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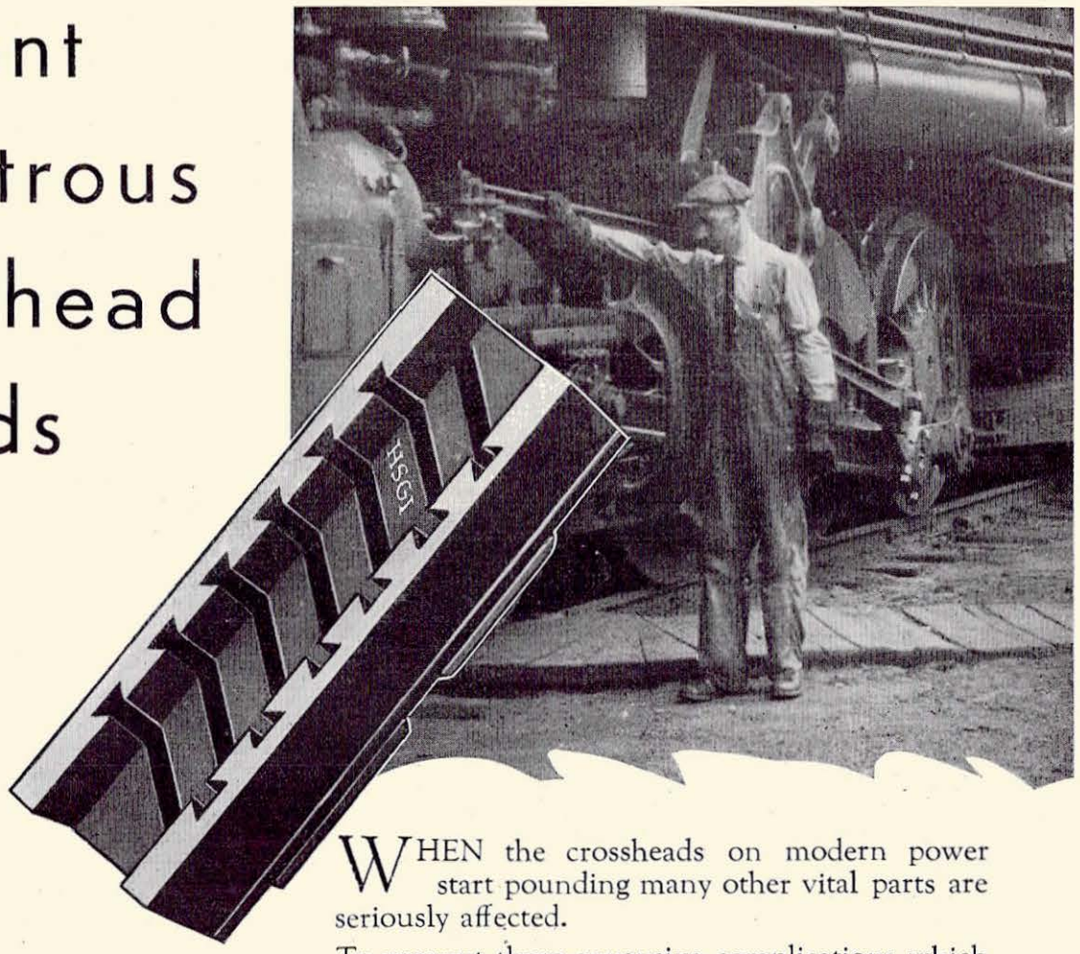
Prevent Disastrous Crosshead Pounds



WHEN the crossheads on modern power start pounding many other vital parts are seriously affected.

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Their wear-resisting qualities reduce the maintenance cost of guides, rods, rod bearings, piston packing and many other parts as well as the crossheads.

Crosshead Shoes made of HUNT-SPILLER *Air Furnace* GUN IRON prevent a lot of trouble and grief. The savings in maintenance costs justify their application to every locomotive.

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Valve Bushings
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Hub Liners
Shoes and Wedges
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more than 50 years. He was born in Ireland on March 4, 1855, and graduated from the Royal College of Science at Dublin in 1876. Mr. Montfort obtained his first railway experience in July, 1880,

Richard Montfort

when he was appointed bridge engineer of the Louisville & Nashville. Three years later he became resident engineer in charge of roadway, bridges and buildings, then being promoted to chief engineer in 1887. He was appointed consulting engineer on January 1, 1906.

Eugene M. Weaver, formerly engineer maintenance of way of the Long Island, and at one time signal engineer of that

Eugene M. Weaver

road, died on January 22 at Rock Glen, Pa. Mr. Weaver was born at Danville, Pa., on April 6, 1859, and started his railroad career on September 15, 1878, as a clerk and telegraph operator on the Pennsylvania at Riverside, Pa. Until December 15, 1882, he was moved about on the Pennsylvania in this same capacity, but on that date he was transferred to Gowen, Pa., where he served successively as passenger agent, freight agent, express agent and yardmaster up to June 1, 1885, when he left the railroad to engage in other work. Mr. Weaver returned to the Pennsylvania on October 1, 1889, and was assigned to St. Clair, Pa., where he held successively the same positions which he had held formerly at Gowen, Pa. In 1892 he left the Pennsylvania, accepting the position of mechanical and electrical foreman on the New York Central & Hudson River (now part of the New York Central), and four years later he was appointed chief electrician of that road. He held this latter position for three years and was then made superintendent of signals on the N. Y. C. & H. R., which position he also held for a period of three years. On June 1, 1903, he went with the Long Island as signal engineer, and in this capacity he was in charge of the first electrification work on that road. On July 20, 1911, he was promoted to engineer maintenance of way, and after more than 15 years active service in this capacity, he was retired under the pension rules of the company on November 1, 1926.

Edward Gagel, formerly chief engineer of the New York, New Haven & Hartford, died at his home at West Haven, Conn., on February 12, of heart disease. Mr. Gagel was born at Mount Hope, N. Y., on October 25, 1858. He received his education in the public schools at Mount Hope, and Cooper Institute, New York, and entered railroad service with the Brooklyn, Flatbush & Coney Island Railroad in December, 1877, at the age of 19. In April, 1879, he became assistant engineer for the Metropolitan Elevated. Early in the following year he spent a few months as draftsman for the West Side & Yonkers (now part of the New York Central), and in March, 1880 went to the New York & New England (now part of the New Haven) as leveller and draftsman. During the year 1882 he was, successively, a transitman for the Erie & Wyoming Valley (now part of the Erie), engineer for the Pittsburgh, McKeesport

Edward Gagel

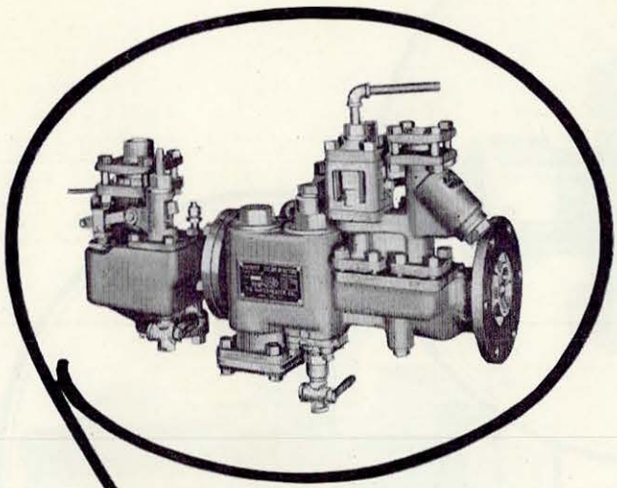
& Youghiogheny (now part of the Pittsburgh & Lake Erie), and draftsman for the New York Central. In December, 1882, after five years of experience with seven different railroads, he first entered the service of the New York, New Haven & Hartford as a draftsman. In November, 1885, he was appointed assistant engineer, and in June, 1891, became district engineer. After nine years in that position he again became assistant engineer in July, 1900. In June, 1904, he was made principal assistant engineer, and in October, 1905, was appointed chief engineer for the entire system, the position which he held until his retirement on October 1, 1929.

Harry C. Stevens, general storekeeper of the Wabash and the Ann Arbor, who died at Toledo, Ohio, on January 12, had been engaged in railway storekeeping service for 25 years. He was born at Smith Center, Kan., on July 29, 1881, and after completing a business course, entered railway service in 1902 as a laborer in the stores department of the Atchison, Topeka & Santa Fe. After occupying several minor positions with the Santa Fe and the St. Louis-San Francisco, and spending three months with the Kennefícke-Hammond Construction Company on the building of

H. C. Stevens

the White River extension of the Missouri Pacific from Aurora, Mo., Mr. Stevens returned to the Santa Fe in the office of the general storekeeper of the system at Topeka, Kan. In 1905 he was advanced to chief clerk to the general storekeeper, then being appointed superintendent of stores of the National of Mexico, with headquarters at San Luis Potosi, S. L. P., in 1910. During 1914 he left Mexico because of revolutionary conditions and in the following year became local storekeeper on the Union Pacific at Armstrong, Kan., where he remained until August of the same year, when he was promoted to division storekeeper of the Colorado division at Denver, Colo. During 1916 and 1917 Mr. Stevens was transferred to the Wyoming division at Cheyenne, Wyo., and to the Kansas division at Armstrong. From September, 1917, until January, 1923, he served successively as general storekeeper and assistant to the works manager of the Chester Shipbuilding Company at Chester, Pa., as purchasing agent of the Lake Torpedo Boat Company at Bridgeport, Conn., and with the purchases and stores section of the United States Railroad Administration at Washington, D. C. Mr. Stevens was appointed general storekeeper of the Wabash and the Ann Arbor, with headquarters at St. Louis, Mo., on January 1, 1923.

Putting Exhaust Steam To Work



Approximately 58 per cent of the coal fired on a locomotive is lost out the stack in the form of heat in the exhaust steam.

The reclaiming of any of this waste heat would result directly in a fuel saving. Preheating the boiler feed water is the most practical way of reclaiming a portion of this waste heat.

The Elesco exhaust steam injector, operating on exhaust steam from the cylinders instead of live steam from the boiler, is a medium for accomplishing this economy. It is easily operated and it is a reliable device for preheating the boiler feed water, thus effecting a fuel saving of from 8 to 12 per cent.

THE SUPERHEATER COMPANY

60 East 42nd Street
NEW YORK

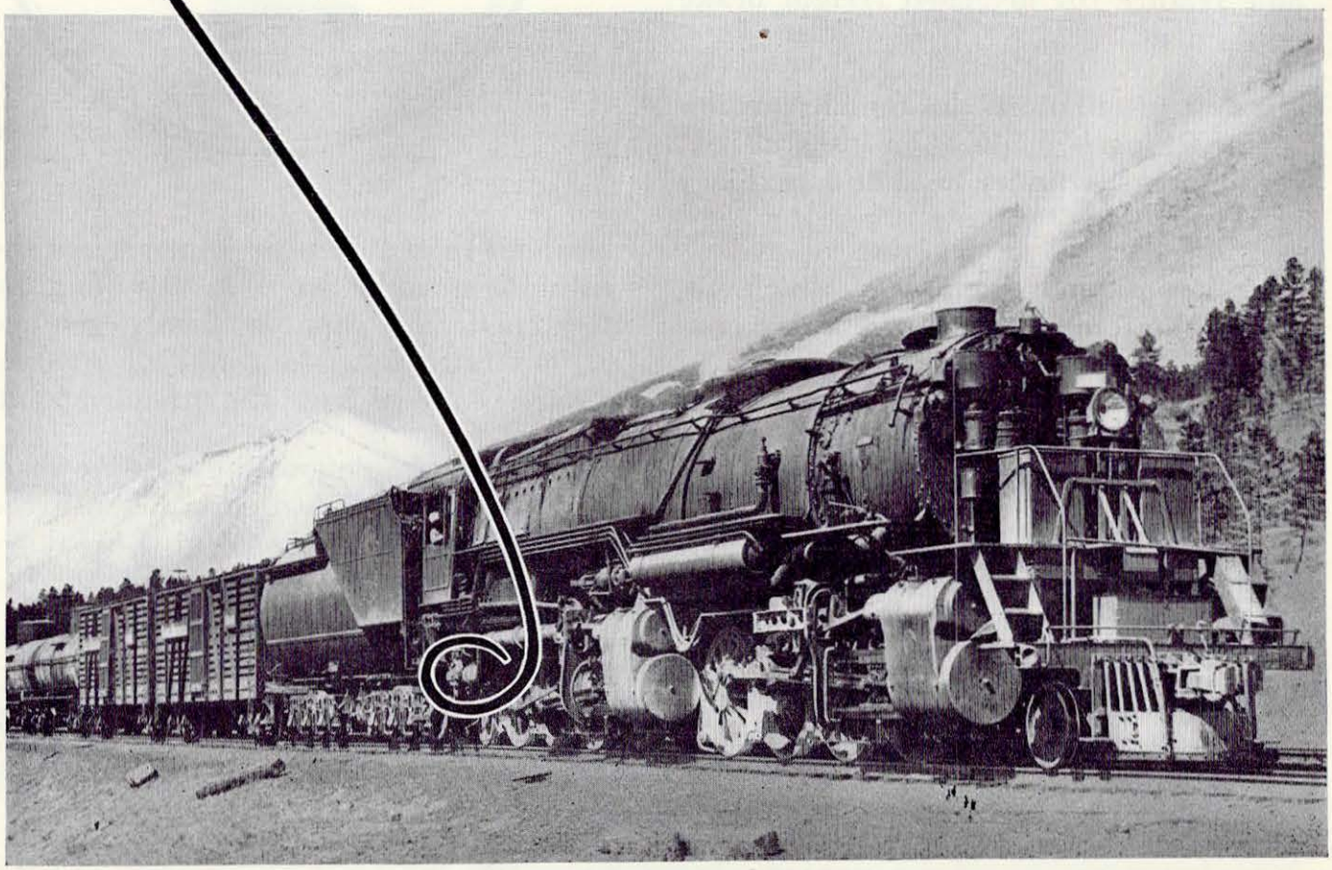
ELESCO

Peoples Gas Building
CHICAGO

Canada: THE SUPERHEATER COMPANY, Limited, Montreal

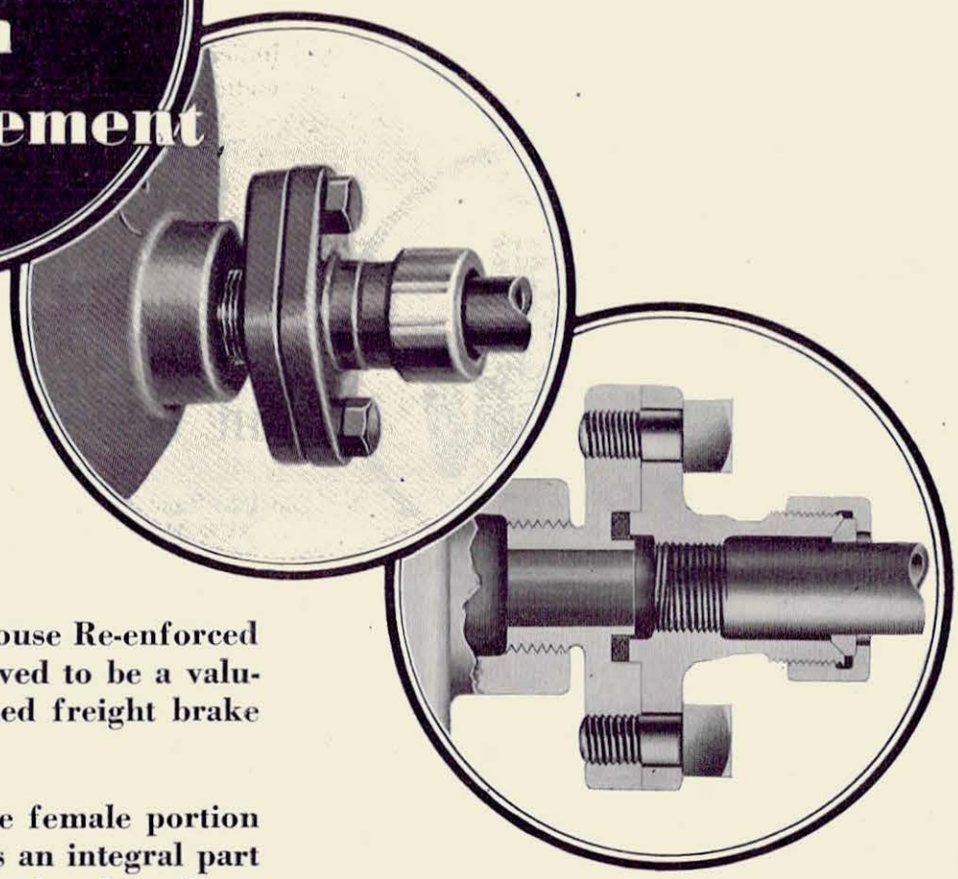
Superheaters
Superheated Steam Pyrometers
Feed Water Heaters
Exhaust Steam Injectors

A-576



Extending the Scope of an Improvement

This improvement provides tight joints for the brake cylinder pipe, and thereby assures a more effective brake and reduces maintenance expense.



THE Westinghouse Re-enforced Flanged Union has proved to be a valuable feature for detached freight brake equipment.

On new installations the female portion of the fitting is made as an integral part of the brake cylinder head and auxiliary reservoir.

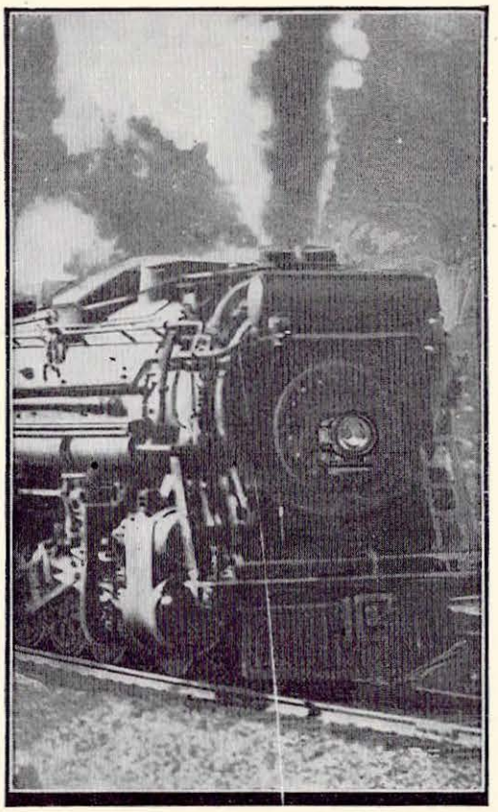
Now, by means of an *adapter*, which embodies the female part of the union connection, and screws into the tapped connection of the reservoir and cylinder head, the advantages of this feature have been made available for existing equipments.

This adapter is of steel, with a stud portion of ample cross section — much stronger than a 1″ pipe joint. When the fitting is assembled and the clamping nut tightened, the pipe is firmly gripped at its strongest section, and all bending strains removed from the threaded joint.

Thus, in a simple and inexpensive manner, the advantages of our Re-enforced Flanged Union—reduced pipe breakage and joint leakage—may be extended to existing brake equipments.

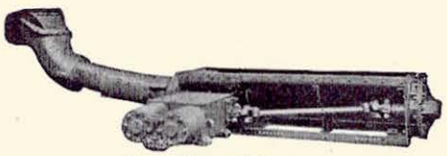
WESTINGHOUSE AIR BRAKE CO.

General Office and Works, WILMERDING, PA.

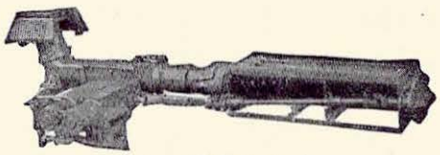


DEPENDABILITY!

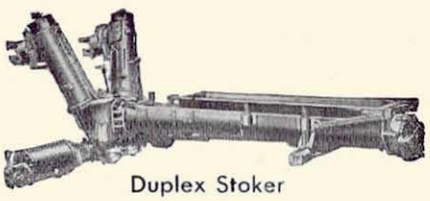
The Life of Transportation



Type "B-K" Stoker



Type "B" Stoker



Duplex Stoker

■ The present tendency toward long, continuous service renders "ton-miles-per-hour" no longer an accurate yardstick of locomotive performance—today "total-ton-miles-per-month" measures locomotive capacity and efficiency.

■ To get maximum train miles and maximum ton miles month after month, every accessory on the locomotive must be as dependable as the locomotive itself.

■ There is one device on which such service rests more than on any other single locomotive accessory, namely, the stoker.

■ Practically all other locomotive accessories are in duplicate, therefore as there is but one stoker, only a machine that has stood the test of service should be selected if present-day requirements are expected.

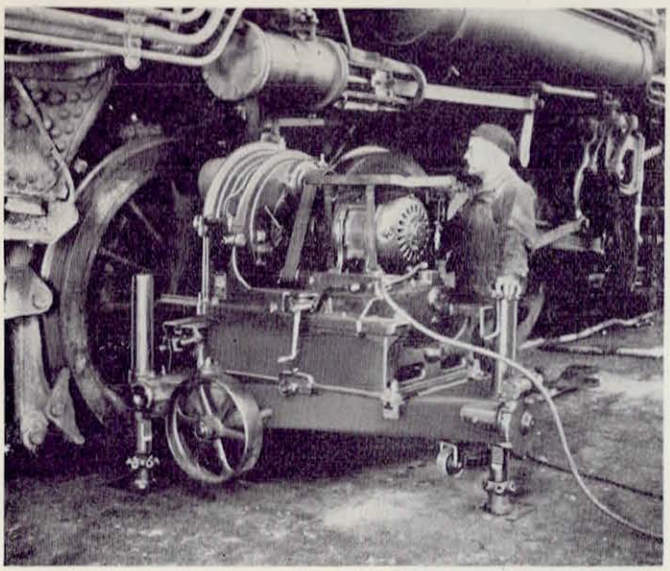
STANDARD STOKERS ARE DEPENDABLE STOKERS.

THE STANDARD STOKER COMPANY, Inc.

NEW YORK CHICAGO ERIE

NO MORE HOT ROD BEARINGS

when crank pins are ground with a MICRO



Run the Micro Portable Crank Pin Grinder right up to the driver, set up the job and grind both steps of those main pins in less than 2 hours time.

THE Micro Portable Crank Pin Grinder overcomes hot rod bearing difficulties, because it gets at the seat of the trouble. In most cases rod bearings become hot due to worn bearing surfaces on the pins. Main pins and side rod pins are ground to an absolute roundness and smoothness on the Micro grinder. The maximum bearing surfaces produced result in longest possible service, thereby eliminating engine delays on the road and at terminal points.

Many railroad shops are saving considerable time and labor costs with Micro Portable Crank Pin Grinders. Write for illustrated folder.

MICRO MACHINE COMPANY

Bettendorf — MANUFACTURERS AND DESIGNERS OF *PRECISION GRINDERS* FOR ALL PURPOSES — Iowa, U-S-A

MAGNUS COMPANY

(INCORPORATED)

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AND

Bronze Engine Castings

New York **Chicago**

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KERITE

has been continuously demonstrating the fact that it is the most reliable and permanent insulation known

THE KERITE INSULATED WIRE & CABLE COMPANY INC

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CAR LIGHTING EQUIPMENT

The Safety Car Heating and Lighting Co.

New York Chicago St. Louis Boston
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CAMEL & YOUNGSTOWN

Freight Car Door Fixtures

Corrugated Steel Freight Car Doors

CAMEL SALES COMPANY 332 South Michigan Avenue CHICAGO, ILLINOIS

STEEL taped cables buried directly in the ground provide the modern signal circuits for railroads. They replace wooden trunking which rots, allows water and grit to leak in and gets damaged by loose equipment and derailments. The protection afforded to the conductors by the surrounding metal sheath keeps the insulation in perfect condition for many years.

OKONITE steel taped cables eliminate maintenance and cost less in the long run. Ask for information.

THE OKONITE COMPANY
Founded 1878

THE OKONITE-CALLENDER CABLE COMPANY, INC.
Factories: Passaic, N. J. Paterson, N. J.

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BIRMINGHAM SAN FRANCISCO LOS ANGELES SEATTLE DALLAS
General Electric Supply Corp. Boston, Mass.

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West Liquid Soap

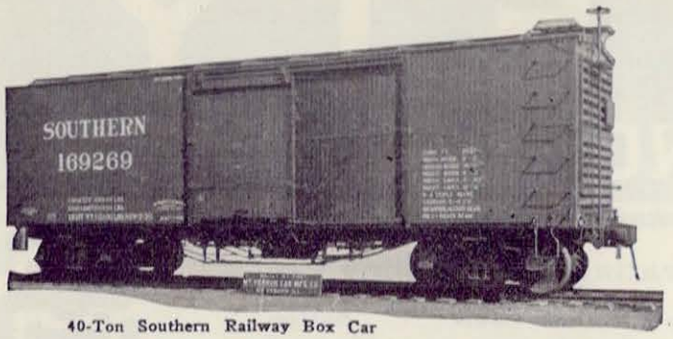
More sanitary and economical than linen towels and cake soap.

Westowls do not have to be laundered, and there is no waste with West Liquid Soap.

Handsome enameled sheet steel cabinets are furnished for Westowls and convenient tilting dispensers for West Liquid Soap.

WEST DISINFECTING CO.
RAILROAD DEPARTMENT
Railway Exch. Bldg. Chicago

MT. VERNON CAR MFG. CO. MT. VERNON, ILL.



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Builders of
All Kinds of Freight Cars

Annual Capacity { 12,000 Freight Cars; 125,000 { Chilled Tread Wheels; 20,000 Tons Forgings

Individual Shop and Special Facilities for Rebuilding and Repairing Cars

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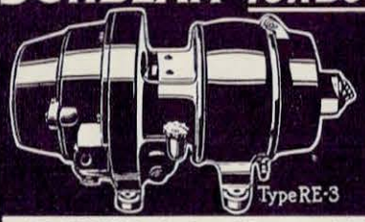
Type RE-3

FOR SERVICE, SAFETY, ECONOMY

RANGING in size from 500 to 4000 watts, Sunbeam Turbo Generators have demonstrated their uniform dependability in every country of the world where locomotives are in use. Easily accessible for adjustments, they keep labor costs low and their sturdy construction makes large repair part stocks unnecessary. Backed by almost half a century of locomotive lighting experience, they combine three locomotive equipment essentials—service, safety and economy.

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EVANSVILLE, INDIANA, U. S. A.
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CAR HEATING

Full 2-inch Steam area

2-inch End Valves

No steam-hose Renewals

2-inch Metallic Conduits

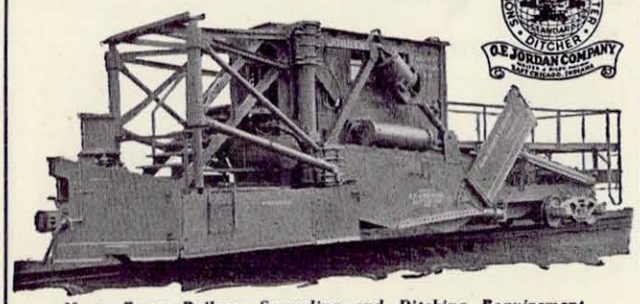
Low Maintenance

2-inch Couplers

VAPOR CAR HEATING CO., Inc.
Railway Exchange Chicago

NEW JORDAN TYPE "A" SPREADER-DITCHER

JORDAN SPREADER — Does the Work of an Army of Men
SNOW PLOW ICE CUTTER DITCHER
O. F. JORDAN COMPANY



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Walter J. Riley, President

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1,300,000 cars in service on over 60 Railroads and Car Lines

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Reduces Friction on Rails 15%
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all standard processes

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The Safety Car Heating and Lighting Co.

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Corrugated Steel Freight Car Doors

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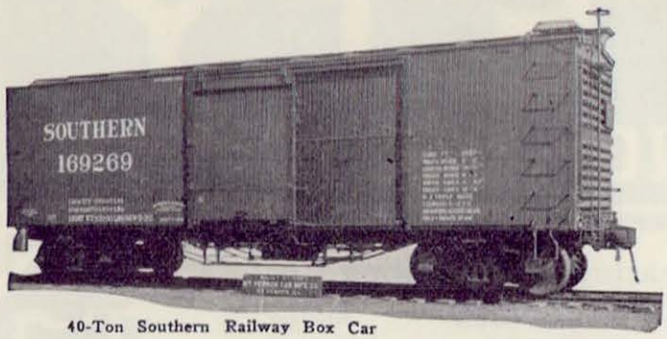

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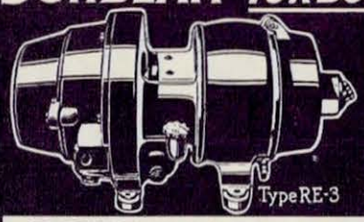
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Full 2-inch Steam area

No steam-hose Renewals

Low Maintenance

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2-inch Couplers

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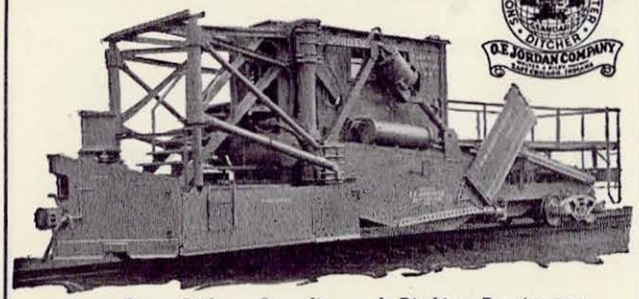
Railway Exchange Chicago

NEW JORDAN TYPE "A" SPREADER-DITCHER



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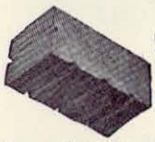

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RAIL ANTI-CREEPER
THE P. & M. CO.
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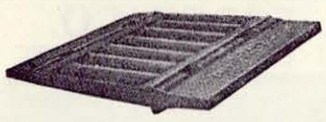
Montreal London Paris Calcutta Sydney



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SALES or promotion work in Machine Tool or Supply line on Railroads. Chicago and west, applicant thoroughly acquainted with Mechanical officials on Western Roads. Address Box 825, RAILWAY AGE, 30 Church St., New York City.

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SEND for Free Special Bulletin and learn how to increase your knowledge of practical railroad work and fit yourself for promotion. The Railway Educational Bureau, Omaha, Neb.

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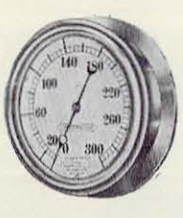
Pop Valves—Steam Gauges
the quality standard for over 50 years.
Exclusive features insuring greatest efficiency and durability.
THE ASHTON VALVE CO.
New York, Boston, Chicago and San Francisco


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Aluminum Co. of America.

Air Lifts.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Airport Drainage.
Armco-Culvert Mfrs. Assoc.
Republic Steel Corp.

Air Pumps.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Air Reservoir Joints—(See Joints, Air Reservoir).

Alloy Steel.
Bethlehem Steel Co.
Illinois Steel Co.
Republic Steel Corp.
Ryerson & Son, Inc., Jos. T.

Alloys.
Electro Metallurgical Sales Corporation.

Alloys, Strong Aluminum
Aluminum Co. of America.
General Cable Corp.

Angle Bars — (See Joints, Rail).

Angles, Channels and Tees—(See Shapes, Structural).

Anti-Creepers, Rail.
Bethlehem Steel Co.
P. & M. Company, The.

Arch, Locomotive Brick.
American Arch Co.

Arresters, Lightning.
General Electric Co.
General Railway Signal Co.
P. & M. Company.
Railroad Supply Co., The
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Ash Conveyors.
Industrial Brownhoist Corp.

Ash Handling Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Ash Pans, Cast Steel.
General Steel Castings Corp.

Auxiliary Locomotive.
Bethlehem Steel Company.

Axles, Car and Locomotive.
American Locomotive Co.
Baldwin Locomotive Works
Bethlehem Steel Corp.
Carnegie Steel Co.
Illinois Steel Co.
Lima Locomotive Works.
Midvale Co., The
National Railway Appliance Co.
Standard Steel Works Co.

Axles, Mine Car.
Brill Co., The J. G.
Mt. Vernon Car Mfg. Co.

Axles, Motor Trucks.
Timken-Detroit Axle Co.

Babbitt Metal.
National Bearing Metals Corp.
Ryerson & Son, Inc., Jos. T.
Westinghouse Elec. & Mfg. Co.

Baggage Door Controller Device.
Edwards Co., O. M.

Barges, Steel.
American Bridge Co.

Bars, Concrete, Reinforcing.
Carnegie Steel Co.
Central Alloy Steel Corp.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Bars, Iron and Steel.
Carnegie Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Illinois Steel Co.
Inland Steel Company.
Lockhart Iron & Steel Co.
McConway & Torley Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Bars, Rolled Steel.
Carnegie Steel Co.

Batteries, Lighting.
Electric Storage Battery Co.

Batteries, Starting.
Electric Storage Battery Co.

Batteries, Storage.
Electric Storage Battery Co.
Railroad Supply Co.
Safety Car Heating & Lighting Co.

Batteries, Wet Cell.
Electric Storage Battery Co.

Beams, Channel & Angle.
Carnegie Steel Co.
Illinois Steel Co.

Bearings, Axle Generator.
S. K. F. Industries, Inc.
Westinghouse Elec. & Mfg. Co.

Bearings, Ball Thrust.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The

Bearings, Center.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Miner, W. H.
Pressed Steel Car Co.
Stucki Co., A.
Symington Co., The.

Bearings, Journal.
Fafnir Bearing Co.
Magnus Co., Inc.
National Bearing Metals Corp.
S. K. F. Industries, Inc
Timken Roller Bearing Co., The

Bearings, Journal Roller.
Fafnir Bearing Co.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The

Bearings, Roller.
American Steel Foundries Co.
Fafnir Bearing Co.
Hyatt Roller Bearing Co.
Miner, W. H.
Shafer Bearing Corp'n.
S. K. F. Industries, Inc.
Standard Car Truck Co
Stucki Co., A.
Timken Roller Bearing Co.
Wine Railway Appliance Co.

Bearings, Roller Side.
Q. & C. Company, The
Standard Coupler Co.

Bearings, Side.
American Steel Foundries.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
Standard Car Truck Co.
Wine Railway Appliance Co.

Beds, Cast Steel, Locomotive.
General Steel Castings Corp.

Bell Ringer, Locomotive.
Ardco Mfg. Co.
Prime Mfg. Co., The

Bells, Highway Crossing.
Railroad Supply Co.

Belt Lacing Machines.
Birdsboro Steel Foundry & Mach. Co.

Benders, Rail.
Q & C Co., The

Bending and Straightening Machines.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Billets, Steel.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
McConway & Torley Co.
Midvale Co., The
Ryerson & Son, Jos. T.
Republic Steel Corp.
Standard Steel Works Co.

Blocks, Chain.
Barco Mfg. Co.
Yale & Towne Manufacturing Co.

Blocks, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
Jennison-Wright Co.

Blooms, Steel.
Carnegie Steel Co.
Republic Steel Corp.

Blower Fittings, Automatic Smokebox.
Barco Mfg. Co.

Blowers, Soot.
Rees Mfg. Co.

Blowers, Turbo.
Ingersoll-Rand Co.

Blow Off Line Joints, Roundhouse—(See Joints, etc.)

Blowtorches, Acetylene.
Oxweld Railroad Service Co., The

Boiler Checks.
Prime Manufacturing Co., The

Boilers, Locomotive.
American Locomotive Co.
Baldwin Locomotive Works
Lima Locomotive Works.

Boilers, Scale Proof.
Industrial Brownhoist Corp.

Bolsters, Steel.
American Steel Foundries.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Bradford Corporation.
Brill Co., The J. G.
Buckeye Steel Castings Co
Gould Coupler Co., The
Mt. Vernon Car Mfg. Co.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Symington & Son, Inc., T. H.

Bolsters, Steel.
Ohio Steel Foundry Co., The.

Bolts and Nuts.
Bethlehem Steel Co.
Buffalo Brake Beam Co.
Dardelet Threadlock Corp.
Neely Nut & Bolt Co.
Russell, Burdsall & Ward Bolt and Nut Co.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

Bolts & Nuts, Monel Metal.
International Nickel Co., The.

Bolts, Patch.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Bolts, Track.
Illinois Steel Co.
Inland Steel Co.

Bonders, Rail.
Q & C Co., The.

Bonding Rail Outfits.
Ingersoll-Rand Co.

Bonds, Rail.
American Steel & Wire Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Bonds, Signal.
American Steel & Wire Co.
General Cable Corp.
Railroad Supply Co.

Bond Wire Protection.
P & M Co., The

Boosters, Locomotives.
Franklin Railway Supply Co., Inc.

Boring & Drilling Machines, Horizontal.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Boring Machines, Car Wheel.
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Horizontal.
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Vertical.
Sellers & Co., Inc.. Wm.

Braces, Rail.
Bettendorf Co., The
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
Q. & C. Co., The.
Ramapo Ajax Co.
Symington Co., The.

Brake Beam Safety Guards.
Chicago Railway Equipment Co.

Brake Beam Supports.
American Steel Foundries.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Davis Brake Beam Co.

Brake Beams.
American Steel Foundries
Bradford Corporation.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Davis Brake Beam Co.
Hunt-Spiller Mfg. Corp.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.

Brake Drums.
American Car & Foundry Motors Co.
Hunt-Spiller Mfg. Corp.

Brake Forgings, Pins, Levers, etc.
American Steel Foundries.
Brill Co., The J. G.
Davis Brake Beam Co.
Mt. Vernon Car Mfg. Co
Schaefer Equipment Co

Brakes, Hand.
National Brake Co.

Brake Heads.
American Steel Foundries.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Davis Brake Beam Co.
Pressed Steel Car Co.

Brake Jaws.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Schaefer Equipment Co.
Steel Car Forge Co.

Brake Shoes.
American Brake Shoe & Foundry Co.
American Steel Foundries.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Fort Pitt Malleable Iron Co.
Mt. Vernon Car Mfg. Co.

Brakes, Air.
General Electric Co.
Westinghouse Air Brake Co.

Brakes, Clasp.
American Steel Foundries.

Brakes, Electric.
Westinghouse Air Brake Co.

Brakes, Hand.
Miner, W. H.
National Brake Co.
National Malleable & Steel Castings Co.
Wine Railway Appliance Co.

Brass, Sash.
Edwards Co., O. M.

Brick, Locomotive Arch.
American Arch Co.

Bridge Builders.
American Bridge Co.
Bethlehem Steel Company.

Bridge Floors.
Armco Culvert Mfrs. Assoc.

Bridge & Crossing Plank, Creosoted.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Bridge Flooring.
Carey Co., The, Philip.

Bridge Material.
International Creosoting & Construction Co.

Bridge Material, Creosoted.
National Lumber & Creosoting Co.

Bridge Stringers — (See Stringers, Bridge).

Bronze Powder, Aluminum.
Aluminum Co. of America.

Bucket Handling.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Whiting Corporation.

Buckets, Grab.
American Bridge Co.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Buffers, Friction.
Edgewater Steel Co.
Miner, W. H.
Standard Coupler Co.
Waugh Equipment Co.
Westinghouse Air Brake Co.

Buffers, Radial.
Franklin Railway Supply Co., Inc.

Building Materials.
Carey & Co., Philip, The.
Johns-Manville Corp.

Buildings, Iron, Steel & Steel Concrete.
American Bridge Co.
United Engineers & Constructors, Inc.

Bulldozers.
Ryerson & Son, Joseph T.

Buses, Motor.
Reo Motor Car Co.

Bushings, Grease Cup.
Prime Mfg. Co., The.

Cable Accessories, Electrical.
General Cable Corp.
Graybar Electric Co.

Cables, Electric.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Cable Corp.
General Electric Co.
Graybar Electric Co.
Ketrie Insulated Wire & Cable Co.
Okonite Co., The.

Cableways—(See Tramways)

Caps, Grease.
Prime Mfg. Co., The.

Carbide Calcium.
Oxweld Railroad Co., The
Union Carbide Sales Co.

Car Insulation.
Carey & Co., Philip, The.

Car Lighting Equipment—(See Lighting Car Equipment).

Carlines.
Hutchins Car Rfg. Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Car Material, Wood.
Central Coal & Coke Co.

Car Parts and Appliances.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

Car Parts, Freight.
Bettendorf Co., The.
General American Tank Car Corporation.
Pressed Steel Car Co.

Car Parts, Passenger.
Brill Co., The J. G.
St. Louis Car Co.

Car Repairs.
General American Tank Car Corporation.
Pressed Steel Car Co.
St. Louis Car Co.
Tennessee Coal, Iron & Railroad Co.

Car Retarder Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Car Siding (See Siding Car, etc.)

Cars, Baggage.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Cars, Ballast.
Bethlehem Steel Company.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Caboose, Coal & Stock.
Mt. Vernon Car Mfg. Co.

Cars, Convertible.
Mt. Vernon Car Mfg. Co.

Cars, Dump.
Bethlehem Steel Company.
Bettendorf Co., The
Differential Steel Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Flat, Narrow Gauge.
Bettendorf Co., The.
Western Wheeled Scraper Co.

Cars, Freight.
Bethlehem Steel Co.
Bettendorf Co., The
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Co.

Cars, Freight (New and Repaired).
Bethlehem Steel Company.
Bettendorf Co., The.
Pressed Steel Car Co.

Cars, Gasoline-Electric.
Brill Co., The J. G.
Electro-Motive Co.
St. Louis Car Co.

Cars, Gasoline Motor.
Brill Co., The J. G.
St. Louis Car Co.

Cars, Hand & Push.
Fairbanks-Morse & Co.

Cars, Industrial.
Bethlehem Steel Company.
Brill Co., The J. G.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Motor.
Fairbanks-Morse & Co.

Cars, Motor Inspection.
Fairbanks-Morse & Co.

Cars, Oil Electric.
Westinghouse Elec. & Mfg. Co.

Cars, Ore.
Brill Co., The J. G.
Pressed Steel Car Co.

Cars, Passenger.
Bethlehem Steel Company.
Brill Co., The J. G.
Electro Motive Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.
St. Louis Car Co.

Cars, Power Units.
Brill Co., The J. G.
Electro Motive Co.

Cars, Quarry.
Western Wheeled Scraper Co.

Cars, Rebuilt and Repaired.
Bettendorf Co., The
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Refrigerator.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Cars, Second-Hand.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Self-Propelled Passenger.
Brill Co., The J. G.
Electro Motive Co.
General Electric Co.
Pullman Car & Mfg. Corp.
Westinghouse Elec. & Mfg. Co.

Cars, Spreader.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Cars, Tank.
Bethlehem Steel Company.
General American Tank Car Corp.
Pressed Steel Car Co.

Carts, Dump.
Western Wheeled Scraper Co.

Castings, Alloy Steel.
Symington Co., The
Union Spring & Mfg. Co.

Castings, Brass and Bronze.
General Railway Signal Co.
Magnus Co., Inc.
National Bearing Metals Corp.
Union Switch & Signal Co.

Castings, Gray Iron.
American Brake Shoe & Foundry Co.
American Locomotive Co.
Baldwin Locomotive Works
General Railway Signal Co
Locomotive Finished Material Co.
Mt. Vernon Car Mfg. Co.
Rampo Ajax Corp.
Union Switch & Signal Co.

Castings, Gun Iron.
Hunt-Spiller Mfg. Corp.

Castings, Iron & Steel.
Industrial Brownhoist Corp.

Castings, Malleable Iron.
Buckeye Steel Castings Co.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
P & M Company, The.
Pressed Steel Car Co.
Symington Co., The
Universal Draft Gear Attachment Co.

Castings, Monel Metal.
International Nickel Co., The.

Castings, Steel.
Allegheny Steel Co.
American Locomotive Co.
American Steel Foundries.
Bethlehem Steel Co.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach Co.
Buckeye Steel Castings Co.
General Steel Castings Corp.
Gould Coupler Co., The
McConway & Torley Co.
Midvale Co., The.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Steel Casting Co.
Universal Draft Gear Attachment Co.

Castings, Steel Loco.
Birdsboro Steel Foundry & Mach. Co.
General Steel Castings Corp.
Gould Coupler Co., The
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Castings, Steel Vanadium.
Birdsboro Steel Foundry & Mach Co.
Brill Co., The J. G.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Catchbasins, Corrugated Iron.
Armco Culvert Mfrs. Assoc.

Cellers, Engine Truck.
Ardco Mfg. Co.

Cement Car, Asphalt.
Lehon Co., The
Sherwin-Williams Co.

Cement, High Temperature.
Carey Co., Philip, The.
Johns-Manville Corp.

Cements, Asbestos and Magnesia.
Carey Co., Phillip, The.

Center Plates — (See Bearings, Center).

Center Sills.
Bettendorf Co., The.
Bradford Corporation.

Chain Monel Metal.
International Nickel Co. The.

Chemicals.
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.

Chemicals, Boiler.
Bird-Archer Co., The.

Chemicals, Cleaning.
Oakite Products, Inc.

Chemists.
Bird-Archer Co., The
Dearborn Chemical Co.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Chromium.
Electro Metallurgical Sales Corp.

Chromium Plating.
Worthington Pump & Machinery Corp.

Chucks, Lathe.
Ryerson & Son, Jos. T.

Cinder Handling Plants.
Roberts & Schaefer Co.

Circuit Breakers.
General Electric Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Clamps, Flanging.
Ryerson & Sons, Jos. T.

Clamps, Guard Rail.
O. & C. Co., The.
Westinghouse Air Brake Co.

Clamps, Hose.
Ingersoll-Rand Co.
National Malleable & Steel Castings Co.
Vapor Car Heating & Lighting Co.
Westinghouse Air Brake Co.

Clamps, Pipe.
Franklin Railway Supply Co., Inc.
National Malleable & Steel Castings Co.

Clamps, Rail Cutting.
Oxweld Railroad Service Co., The.

Classification Yard Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Cleaners, Aircraft.
Oakite Products, Inc.

Cleaners, Air Pump.
Oakite Products, Inc.
Westinghouse Air Brake Co.

Cleaners, Bus & Truck.
Oakite Products, Inc.

Cleaners, Car.
Oakite Products, Inc.

Cleaners, Flue.
Ryerson & Son, Jos. T.

Cleaners, General.
Oakite Products, Inc.

Cleaners, Locomotive.
Oakite Products, Inc.

Cleaners, Metal.
Oakite Products, Inc.

Clips, Wire Rope.
American Hoist & Derrick Co.

Coach and Coach Yard Steam Joints—(See Joints, etc.)

Coaches, Motor.
American Car & Foundry Motors Co.
Dodge Motor Truck Corp.
International Harvester Co.
White Co., The.

Coaches, Second-Hand.
Hyman-Michaels Co.

Coal, Ore & Ash Handling Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.
Roberts & Schaefer Co.

Coal Pushers.
Standard Stoker Co.

Coaling Stations.
American Bridge Co.
Fairbanks-Morse & Co.
Roberts & Schaefer Co.

Cocks, Angle.
Westinghouse Air Brake Co.

Cocks, Blow-Off.
Bird-Archer Co., The.

Cocks, Cylinder.
Prime Manufacturing Co., The.

Columns, Water.
Prime Manufacturing Co., The.

Combination Crane Pile Drivers.
Industrial Brownhoist Corp.

Compounds, Boiler.
Dearborn Chemical Co.
Bird-Archer Co., The
General Electric Co.

Compounds, Cleaning.
Oakite Products, Inc.

Compounds, Cutting.
Oakite Products, Inc.

Compounds, Grinding.
Oakite Products, Inc.

Compounds, Paint Removing.
Oakite Products, Inc.

Compounds, Rust Proofing.
Oakite Products, Inc.

Compressors, Air.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Concrete Floor Slabs.
Federal American Cement Tile Co.

Concrete Reinforcement.
American Steel & Wire Co.
Carnegie Steel Co.
Ryerson & Sons, Jos. T.

Concrete Roofing, Tile.
Federal American Cement Tile Co.

Condensers.
Ingersoll-Rand Co.

Condensing Apparatus.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Conduit, Rigid.
Aluminum Co. of America.

Conduits, Metallic Flexible.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Graybar Electric Co.
Vapor Car Heating Co., Inc.

Conduit, Underground.
Graybar Electric Co.
Johns-Manville Corp.

Connections.
Prime Manufacturing Co., The.

Connections, Lever.
National Malleable & Steel Castings Co.

Connections, Truck.
National Malleable & Steel Castings Co.

Connections, Truck Lever.
Schaefer Equipment Co.

Contraction Joint.
General Railway Signal Co.

Control Devices, Train Speed.
Union Switch & Signal Co.

Control, Locomotive.
Valve Pilot Co.

Controllers, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Conveying Machinery.
American Bridge Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Corrugated Sheet.
Aluminum Co. of America.

Conveyor, Ash — (See Coal Ore and Ash Handling Mach.)

Coupler Pockets—(See Draft Yokes.)

Coupler Yokes.
Bettendorf Co., The.
Gould Coupler Co.
Symington Co., The.

Couplers.
American Steel Foundries.
Buckeye Steel Castings Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
McConway & Torley Co.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Westinghouse Air Brake Co.

Couplings, Hose.
Fort Pitt Malleable Iron Co.
Gold Car Htg. & Lighting Co
Ingersoll-Rand Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co

Cranes, Ballast Cleaning.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Barge.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Bracket.
Shephard-Niles Crane & Hoist Corp.

Cranes, Crawler.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Cranes, Crawling Shovels and Draglines.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton, Crane & Shovel Co.

Cranes, Diesel.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Electric Traveling.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Gantry.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.
Shephard-Niles Crane & Hoist Corp.

Cranes, Gasoline.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

Cranes, Grab Bucket.
American Hoist & Derrick Co.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Handpower.
American Hoist & Derrick Co.
Shephard-Niles Crane & Hoist Corp.

Cranes, Jib.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Worthington Pump & Machinery Corp.

Cranes, Locomotive.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

Cranes, Overhead.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Pillar.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Portable.
American Hoist & Derrick Co

Orton Crane & Shovel Co.

Cranes, Tractor.
Orton Crane & Shovel Co.

Cranes, Transfer.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Traveling.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Wharf.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Wrecking.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Crank Pins — (See Pins, Cranks).

Creosote.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
Jennison Wright Co.

Cribbing Units.
Federal American Cement Tile Co.

Cross Arms.
American Bridge Co.
General Electric Supply Corp.
Graybar Electric Co.
International Creosoting & Construction Co.

Cross Ties.
Century Wood Preserving Co.
International Creosoting & Construction Co.

Cross Ties, Creosoted.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Cross Ties, Steel.
Bethlehem Steel Co.

Crossheads & Shoes.
Baldwin Locomotive Wks.
Barco Mfg. Co.
International Creosoting & Construction Co.

Crossing Signals & Signs.
Railroad Supply Co.

Crossings — (See Frogs and Crossings).

Crossings, Pavement.
Carey Co., The Philip

Crushers, Coal.
American Sheet & Tin Plate Co.
Orton Crane & Shovel Co.

Culverts.
Armco Railroad Sales Co.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.
Toncan Culvert Manufacturers' Association.

Culverts Corrugated.
Armco Culvert Manufacturers' Association.
Republic Steel Corp.

Culverts, Paved Invert.
Armco Culvert Mfrs. Assoc.

Cupolas, Foundry.
Hammett, H. G.

Cups, Oil.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.

Curtains, Cab
Lehon Co., The

Curtains & Fixtures, Car Window.
Pantasote Co., Inc., The.

Curtain Material, Car.
Ryerson & Son, Jos. T.

Cutting & Welding Apparatus.
Oxweld Railroad Service Co.
Westinghouse Elec. & Mfg. Co.

Cut-Off Indicators & Recorders.
National Tube Co.
Valve Pilot Co.

Cylinder Parts (Finished & Rough).
Locomotive Finished Material Co.

Cylinders, Air Brake.
Westinghouse Air Brake Co.

Cylinders, Cast Steel Locomotive.
General Steel Castings Corp.
Union Steel Casting Co.

Cylinders, Locomotive.
Locomotive Finished Material Co.

Cylinders, Oxy-Acetylene.
Oxweld Railroad Co., The

Deoxidizers.
Q & C Co., The.
Vanadium Corp. of America.

Derricks.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.

Diesel Electric Power Plants
Fairbanks-Morse & Co.
Westinghouse Elec. & Mfg. Co.

Dirt Collectors.
Westinghouse Air Brake Co.

Disinfectants.
West Disinfecting Co.

Dispatching Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Ditchers.
American Hoist & Derrick Co.
Jordan Co., O. F.

Ditching Machinery.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Door Fixtures—(See Fixtures Car Door).

Doors, Car.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
Wine Railway Appliance Co.

Doors, Folding, Rolling and Sliding.
Kinnear Manufacturing Co.

Doors, Locomotive Firebox.
Franklin Railway Supply Co., Inc.

Doors, Steel.
Kinnear Manufacturing Co.

Doors, Rolling, Steel.
Kinnear Mfg. Co.

Doors, Wood.
Kinnear Mfg. Co.

Draft Arms.
American Steel Foundries.
Birdsboro Steel Foundry & Mach. Co.
Bradford Corporation.
Symington Co., The.
Universal Draft Gear Attachment Co.

Draft Gear Attachments.
Symington Co., The.

Draft Gears.
American Steel Foundries.
Bradford Corporation.
Cardwell-Westinghouse Co.
Edgewater Steel Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Union Draft Gear Co.
Universal Draft Gear Attachment Co.

Draft, Yokes
American Steel Foundries.
Bettendorf Co., The.
Buckeye Steel Castings Co.
Gould Coupler Co., The
McConway & Torley Co.
Miner, W. H.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Co.
Symington Co., The
Universal Draft Gear Attachment Corp.

Draglines.
Orton Crane & Shovel Co.

Drainage Gates.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Drains, Perforated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Drawbar Centering Device.
Gould Coupler Co., The
Miner, W. H.

Drawbars, Unit Safety.
Franklin Railway Supply Co., Inc.
Industrial Brownhoist Corp.

Dredging Machinery.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.

Drilling Machines.
Sellers & Co., Inc., Wm.

Drilling Machines, Bonding.
Railroad Supply Co.

Drilling Machines, Pneumatic.
Ingersoll-Rand Co.

Drilling Machines, Rock.
General Electric Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drilling Machines, Upright and Radial.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Drills.
Ingersoll-Rand Co.

Drills, Close Corner.
Ingersoll-Rand Co.

Drills, Concrete.
Ingersoll-Rand Co.

Drills, Steel Rock and Steel Sharpened.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drills, Track & Bending.
Bird-Archer Co., The.
Ingersoll-Rand Co.

Drinking Cups.
U. S. Envelope Co.

Drive Gas Electric Coaches.
General Electric Co.

Drive Gas Electric Locomotives
Westinghouse Elec. & Mfg. Co.

Driving Boxes (Extended Main).
Franklin Railway Supply Co., Inc.

Drop Door Mechanism.
Wine Railway Appliance Co.

Dynamos — (See Generators Electric).

Electrical Cable Accessories.
General Cable Corp.
General Electric Supply Corp.

Electric Cables.
Anaconda Wire & Cable Co.
General Cable Corp.
General Electric Supply Corp.

Electrical Instruments.
Electric Service Supplies. Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Electrical Supplies.
General Electric Co.
General Electric Supply Corp.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Electrification, Railroad.
Battey & Kipp.
General Electric Co.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Electric Heaters.
General Electric Supply Corp.

Electrical Insulation.
General Cable Corp.
General Electric Supply Corp.

Electrical Porcelain Insulators.
General Electric Supply Corp.

Electric Motors.
General Electric Supply Corp.

Electric Rivet Heaters.
General Electric Supply Corp.

Electric Switches.
General Electric Supply Corp.

Enamels.
du Pont de Nemours & Co., Inc., E. I.
Sherwin-Williams Co.

End Frames, Cast Steel, Passenger Car
General Steel Castings Corp.

Ends, Steel.
Hutchins Car Rfg. Co.
Union Metal Products Co.

Engineers, Consulting, Civil, Elec., Hydraulic, Mechanical.
Battey & Kipp.
Hunt Co., Robt. W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Contracting.
Battey & Kipp.
United Engineers & Constructors, Inc.

Engineers and Contractors.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Construction.
Battey & Kipp.
Roberts & Schaefer Co.
United Engineers & Constructors, Inc.

Engineers and Contractors, Elec. Hydraulic, Mech.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
Roberts & Schaefer Co.

Engineers, Inspecting.
Gulick-Henderson Co.
Hunt Co., Robert W.
Muhlfeld, John E.
Pittsburgh Testing Laboratory.
United Engineers & Constructors, Inc.

Engineers, Valuation.
Hunt Co., Robert W.
United Engineers & Constructors, Inc.

Engines, Crude & Fuel Oil.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Diesel.
Worthington Pump & Machinery Corp.

Engines, Gas.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Engines, Gas & Gasoline.
American Car & Foundry Motors Co.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Hoisting.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Envelopes.
U. S. Envelope Co.

Excavators.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.

Exhaust & Heater Pipe.
Union Asbestos & Rubber Co.

Exhaust & Ventilating Fans.
General Electric Supply Corp.

Expanders, Tube.
Ryerson & Son, Joseph T.

Explosives.
American Steel & Wire Co.
du Pont de Nemours & Co., Inc., E. I.

Fans, Exhaust & Ventilating.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Fasteners, Car Door.
Camel Sales Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Feed Water Heater Systems.
Bird-Archer Co., The.
Coffin, Jr., Co., The J. S.
Worthington Pump & Machinery Corp.

Fence Posts.
International Creosoting & Construction Co.

Fencing Wire — (See Wire Fence).

Fence Posts, Creosoted.
National Lumber & Creosoting Co.

Ferro Alloys.
Vanadium Corp. of America.

Ferro, Chromium.
Vanadium Corp. of America.

Ferro Molybdenum.
Electro Metallurgical Sales Corp.
Vanadium Corp. of America

Ferro Silicon.
Vanadium Corp. of America.

Ferro Tungsten.
Vanadium Corp. of America.

Ferro Vanadium.
Vanadium Corp. of America.

Filters, Air.
Westinghouse Air Brake Co.

Filters, Water & Industrial.
Graver Tank & Mfg. Corp.

Filtration Plants, (Water).
Graver Tank & Mfg. Corp.

Fireboxes.
American Locomotive Co.
Baldwin Locomotive Works

Fire Fighting & Protection Equipment.
Johns-Manville Corp.

Fittings, Air Brakes.
Westinghouse Air Brake Co.

Fittings, Steam.
Vapor Car Heating Co., Inc.

Fixtures, Car Door.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Flangers, Snow.
Q & C Co., The.

Floodlights.
General Electric Supply Corp.
Graybar Electric Co.
Oxweld Railroad Service Co.
Pyle-National Co.
Symington Co., The.
Westinghouse Elec. & Mfg. Co.

Floodlights, Acetylene.
Oxweld Railroad Service Co., The.

Flooring.
Carey & Co., Philip, The.
Jennison-Wright Co.
Johns-Manville Corp.

Flooring, Car.
Tuco Products Corp.

Flooring, Coach.
Tuco Products Corp.

Flooring, Composition.
Johns-Manville Corp.
Tuco Products Corp.

Flooring, Creosoted.
Central Coal & Coke Co.

Flooring, Wood.
Central Coal & Coke Co.
Century Wood Preserving Co.

Floor Plates, Steel.
Carnegie Steel Co.
Illinois Steel Co.

Floor Slabs, Concrete.
American Cement Tile Mfg. Co.

Flue Cleaners—(See Cleaners, Flue).

Flue Cutters—(See Cutters, Flue).

Flues, Boiler — (See Tubes Boiler).

Flue Shop Equipment.
Ryerson & Son, Joseph T.

Forges, Rivet Heating.
Ryerson & Son, Joseph T.

Forging Hammers.
Industrial Brownhoist Corp.

Forgings.
American Bridge Co.
American Steel Foundries.
Bethlehem Steel Company.

Brill Co., The J. G.
Carnegie Steel Co.
Edgewater Steel Co.
General Railway Signal Co.
Gould Coupler Co., The
Illinois Steel Co.
Midvale Co., The.
Mt. Vernon Car Mfg. Co.
Nealy Nut & Bolt Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Steel Car Forge Co.
Universal Draft Gear Attachment Co.

Forgings, Drop.
Brill Co., The J. G.
General Railway Signal Co.
Steel Car Forge Co.
Union Switch & Signal Co.

Forgings, Monel Metal.
International Nickel Co., The.

Foundry Supplies.
Bird-Archer Co., The

Frames, Cast Steel, Locomotive
General Steel Castings Corp.

Frames, Locomotive.
American Steel Foundries.
American Locomotive Co.
Baldwin Locomotive Works
Birdsboro Steel Foundry & Mach. Co.
Ohio Steel Foundry Co., The.
Union Steel Casting Co.

Frames, Truck.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Buckeye Steel Castings Co.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Pyle-National Co.
Symington Co., The

Frames, Vanadium.
American Locomotive Co.
Baldwin Locomotive Works
Birdsboro Steel Foundry & Mach. Co.
Union Steel Casting Co.

Frogs and Crossings.
Bethlehem Steel Company.
Continuous Rail Crossing Corp.
Ramapo Ajax Corp.

Fulcrums, Brake Beam.
American Steel Foundries.
Brill Co., The J. G.
Chicago Railway Equipment Co.
National Malleable & Steel Castings Co.

Furnaces, Electric.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Furnaces, Gasoline.
Railroad Supply Co.
Whiting Corporation.

Furnaces, Rivet Heating — (See Forges, Rivet Heating).

Furniture.
Aluminum Co. of America.

Gage Testers—(See Testers Gage).

Gages, Air.
Westinghouse Air Brake Co.

Gages, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Gages, Steam.
Ashton Valve Co.

Gages, Wheel Press Recording.
Ashton Valve Co.

Gaskets.
Westinghouse Air Brake Co.

Gasoline.
Ethyl Gasoline Corp.

Gear Blanks, Rolled Steel.
Edgewater Steel Co.
Standard Steel Works Co.

Gears and Pinions.
American Steel Foundries.
Westinghouse Elec. & Mfg. Co.

Gears, Silent.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Gears, Valve — (See Valve Gears).

Generators, Acetylene.
Oxweld Railroad Service Co.

Generators, Car Lighting.
Safety Car Heating & Lighting Co.

Generators, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Goggles, Welding.
Oxweld Railroad Service Co., The.
Sunbeam Electric Mfg. Co.

Graders, Elevating.
Western Wheeled Scraper Co.

Graphite Penetrating Oil.
Alemite Mfg. Corp.

Grapples, Wood.
Industrial Brownhoist Corp.

Grate Bars.
Q & C Co., The.

Grate Shakers, Automatic.
Franklin Railway Supply Co., Inc.

Grates.
Firebar Corp.

Greases.
Alemite Mfg. Corp.

Grease Forming Machines.
Franklin Railway Supply Co., Inc.

Grey Iron.
American Brake Shoe & Foundry Co.

Grinders, Internal.
Micro Machine Co.

Grinding Machines.
Sellers & Co., Inc., Wm.

Grinding Machines, Portable.
Ingersoll-Rand Co.

Guard Rails, Creosoted Wood
International Creosoting & Construction Co.

Guard Rails, Foot Guard.
Q & C Co., The.

Guard Rails (One Piece).
Bethlehem Steel Company.
Ramapo Ajax Corp.

Guard Switch Point.
Q & C Co., The.

Guards, Cattle.
American Bridge Co.

Guards, Dust.
Gould Coupler Co., The
Symington Co., The.

Hair Felt.
Johns-Manville Corp.

Hammers, Pneumatic.
Ingersoll-Rand Co.

Hammers, Riveting.
Ingersoll-Rand Co.

Hammers, Steam.
Industrial Brownhoist Corp.
Sellers & Co., Inc., Wm.

Hand Brakes—(See Brakes, Hand).

Hangers, Ball Bearing.
S. K. F. Industries, Inc.

Hand Rails & Fittings.
Aluminum Co. of America.

Hangers, Bottom Rod Safety.
Chicago Railway Equipment Co.

Hangers, Car Door — (See Fixtures, Car Door).

Headlight Repair Parts, Electric.
Electric Service Supplies Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Headlights, Electric.
General Electric Co.
Sunbeam Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

Headlights, Reflectors & Cases.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Heaters, Electric.
Gold Car Htg. & Ltg. Co.
Westinghouse Electric & Mfg. Co.

Heaters, Electric Rivet.
American Hoist & Derrick Co.

Heaters, Feedwater.
Graver Tank & Mfg. Corp.

Heaters, Feedwater Locomotive.
Coffin Co., Jr., The J. S.
Superheater Company, The.
Worthington Pump & Machinery Corp.

Heaters, Feed Water, Stationary.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Heating & Ventilating Apparatus.
Vapor Car Heating Co., Inc.
Westinghouse, Electric & Mfg. Co.

Heating Equipment, Car.
Gold Car Htg. & Ltg. Co.
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Heating Systems, Car (Electric and Steam).
Gold Car Htg. & Ltg. Co.
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

High Temperature Cements.
Carey & Co., Philip, The.

Highway Crossing Protection Devices.
American Bridge Co.
Franklin Railway Supply Co., Inc.
Railroad Supply Co.

Hoists, Chain.
Milwaukee Electric Crane & Hoist Corp.
Ryerson & Son, Jos. T.

Hoists, Electric.
American Hoist & Derrick Co.
Milwaukee Electric Crane & Hoist Corp.

Hoists, Pneumatic.
Ingersoll-Rand Co.

Hoists, Second-Hand.
Hyman-Michaels Co.

Hoisting Machinery.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.
Milwaukee Electric Crane & Hoist Corp.

Hooks, Wrecking.
National Malleable & Steel Castings Co.

Horns, Pneuphonic.
Westinghouse Air Brake Co.

Hose, Air, Steam, Etc.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Hose, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Hose, Tender.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.

Ice Cutters.
Jordan Co., O. F.

Incandescent Lamps.
General Electric Supply Corp.

Indicators, Speed & Cut-off.
Valve Pilot Co.

Ingots.
Birdsboro Steel Foundry & Mach. Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
McConway & Torley Co.
Standard Steel Works Co.

Injectors, Exhaust Steam.
Sellers & Co., Inc., Wm.
Superheater Co., The.

Inspection of Material and Equipment—(See Engineers, Inspection).

Insulated Wire.
Anaconda Wire & Cable Co.
General Cable Corp.
General Electric Supply Corp

Insulation, Car.
Carey Co., Philip, The.
Lehon Co., The.

Insulation, Car Bldg.
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co.

Insulation, Electrical.
General Cable Corp.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Insulation, Exhaust & Heater Pipe.
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co.

Insulation, Heat.
Carey Co., Philip, The.
Miner, W. H.

Insulation Tape.
General Electric Supply Corp.

Insulators, Electrical, Porcelain.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Interlocking Plant Equipment.
General Railway Signal Co.
Union Switch & Signal Co.

Iron Chain.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.

Iron, Charcoal.
Bethlehem Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.

Iron, Engine Bolt.
Lockhart Iron & Steel Co.

Iron, Forging Billets.
Lockhart Iron & Steel Co.

Iron, Hollow Staybolt.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Hollow Staybolt Bars.
Bethlehem Steel Co.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Pig.
Bethlehem Steel Co.

Iron, Refined.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Iron, Staybolt — (See also Staybolts).
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co
Reading Iron Co.
Ryerson & Son, Jos. T.

Jacking, Locomotive
Carey Co., Philip, The.

Jacks, Smoke.
Carey Co., Philip, The.
Johns-Manville Corp.

Joints, Air Reservoir.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Blow Off Line (Roundhouse).
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Coach and Coach Yard.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Flexible.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Flexible Ball.
Barco Mfg. Co.

Joints, Rail.
American Steel Foundries.
Carnegie Steel Co.
Illinois Steel Co.
Q & C Co., The.
Rail Joint Co.
Union Switch & Signal Co.

Joints, Steam, Air & Liquid.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Swing.
Barco Mfg. Co.
Vapor Car Heating Co., Inc.

Journal Boxes and Lids.
Allegheny Steel Co.
American Steel Foundries.
Brill Co., The J. G.
Gould Coupler Co., The.
Hunt-Spiller Mfg. Corp.
National Malleable & Steel Castings Co.
Pullman Car & Mfg. Corp.
Railway Steel Spring Co.
Symington Co., The.
Union Spring & Mfg. Co.

Journal Oilers, Car & Locomotive.
Ardco Mfg. Co.

Keys, Brake Shoe.
Bradford Corporation.
Mt. Vernon Car Mfg. Co.
Steel Car Forge Co.
Union Spring & Mfg. Co.

Knuckles Emergency.
Q & C Co., The.

Laboratories, Testing.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Lacquers.
General Electric Supply Corp.
Sherwin-Williams Co.

Ladders, Steel Car.
Wine Railway Appliance Co.

Lagging, Locomotive.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lamps, Incandescent.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lamps, Inspector's.
Oxweld Railroad Service Co., The.

Lath, Metal.
Armco Railroad Sales Co.
Truscon Steel Co.

Lathes, Axle.
Sellers & Co., Inc., Wm.

Lathes, Engine.
Ryerson & Son, Joseph T.

Lathes, Wheel.
Sellers & Co., Inc., Wm.

Lead, White.
National Lead Co.

Lighting Equipment, Car.
Electric Storage Battery Co.
Safety Car Htg. & Ltg. Co.

Lighting Fixtures and Systems.
General Electric Supply Corp.
Graybar Electric Co.
Pyle-National Co.
Safety Car Htg. & Ltg. Co.

Lighting Plants, Gas, Electric
Sunbeam Electric Mfg. Co.

Lightning Arresters.
General Electric Supply Corp.

Line Material.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lock Nuts—(See Nut Locks).

Locomotive Water Conditioners.
Bird-Archer Co., The.

Locomotives, Contractors.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Electric.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Locomotives, Gasoline.
Baldwin Locomotive Works.

Locomotives, Gas-Electric.
Electro Motive Co.

Locomotives, Geared.
Lima Locomotive Works.

Locomotives, Industrial.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Mine.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Oil Engine, Electric Driven.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.
Whitcomb & Co., Geo. D.

Locomotives, Rebuilt.
American Locomotive Co.

Locomotives, Repair Parts.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Second-Hand.
Hyman-Michaels Co.

Locomotives, Steam.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotive Stokers.
Standard Stoker Co.

Locomotive Valve Pilot.
Valve Pilot Co.

Lubricants.
Alemite Mfg. Corp.

Lubrication Equipment.
Alemite Mfg. Corp.

Lubrication Systems.
Alemite Mfg. Corp.

Lubricators, Driving Box.
Franklin Railway Supply Co., Inc.

Lubricators, Piston Rod.
Q & C Co., The.

Lumber.
Central Coal & Coke Co.
Curtin-Howe Corp.
West Coast Lumber Trade Extension Bureau.

Lumber, Asbestos.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lumber, Creosote Treated.
International Creosoting & Construction Co.

Lumber, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Industrial Lumber & Creosoting Co.
International Creosoting & Construction Co.
Jennison-Wright Co.
National Lumber & Creosoting Co.

Machinery, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Machine Screws, Monel Metal
International Nickel Co., The.

Magnets, Lifting.
Industrial Brownhoist Corp.
Electro Metallurgical Sales Corp.

Mechanical Draft Apparatus—(See Heating and Vent. App.)

Mechanical Stokers.
Standard Stoker Co.

Melters, Snow, Electric.
Q & C Co., The.

Metallic Flexible Conduit.
General Electric Supply Corp.

Meters, Water & Oil.
Worthington Pump & Machinery Corp.

Milling Machines, Planer Type.
Sellers & Co., Inc., Wm.

Milling Machines, Plain and Universal.
Ryerson & Son, Joseph T.

Mohair Upholstery Velvets.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Molybdenum Metal.
Vanadium Corp. of America.

Monel Metal, Rods, Sheets, Tubes, Wire, etc.
International Nickel Co., The.

Motors, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Motors & Generators.
Fairbanks-Morse & Co.

Moulding.
Aluminum Co. of America.

Multiple V Belt Drives
Worthington Pump and chinery Corp.

Nails.
American Steel & Wire Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Nipples, Air Hose.
Prime Manufacturing Co.

Nozzles, Exhaust.
Franklin Railway Supply Co., Inc.

Nozzles, Oxy-Acetylene Cutting.
Oxweld Railroad Service Co., The.

Nuts—(See Bolts and Nuts).

Nut Locks.
Dardelet Threadlock Corp.
Grip Nut Co.
Reliance Mfg. Co.

Nuts, Tank Hose.
Prime Manufacturing Co., The.

Office Appliances.
Remington-Rand Business Service

Oil-Electric Locomotives.
American Locomotive Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.

Oil Filtering & Storage Systems.
Graver Tank & Mfg. Corp.

Oil, Linseed.
National Lead Co.

Oil Plugs, Steam Chest.
Franklin Railway Supply Co., Inc.

Oxy-Acetylene Apparatus.
Oxweld Railroad Service Co., The.

Oxygen.
Oxweld Railroad Service Co., The.

Packing, Air Pump.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.

Packing, Cylinder and Valve Ring.
Hunt-Spiller Mfg. Corp.
Locomotive Finished Material Co.
Westinghouse Air Brake Co.

Jacking, Locomotive.
Johns-Manville Corp.

Packing, Locomotive Cab Cock.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Ring Boiler.
Union Asbestos & Rubber Co.

Packing, Semi-Metallic.
Pilot Packing Co.
Central Alloy Steel Corp.

Packing, Sheet.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Soft.
Carey & Co., Philip, The.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.

Packing, Throttle.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing.
Westinghouse Air Brake Co.

Paint Burners, Acetylene.
Oxweld Railroad Service Co., The.

Paint, Metal Protective.
National Lead Co.
Sherwin-Williams Co.

Paint, Powder.
Aluminum Co. of America.

Paint Spraying Equipment
De Vilbiss Mfg. Co., The.

Paints.
du Pont de Nemours & Co., Inc., E. I.
National Lead Co.
Sherwin-Williams Co.

Paper, Carbon.
Remington-Rand Business Service

Paper, Sheathing.
Carey & Co., Philip, The.
Lehon Co., The.

Pavement Breakers.
Ingersoll-Rand Co.

Pickling Equipment, Monel Metal.
International Nickel Co., The.

Pile Drivers.
American Hoist & Derrick Co.
Industrial Brownhoist Co.

Piling, Creosoted.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Construction Co.
Jennison-Wright Co.
National Lumber & Creosoting Co.

Piling, Sheet Steel.
American Bridge Co.
Carnegie Steel Co.

Pilot Beams, Cast Steel.
General Steel Castings Corp.
Gould Coupler Co., The

Pilots, Cast Steel.
General Steel Castings Corp.
Locomotive Finished Material Co.

Pins, Airbrake.
Steel Car Forge Company.

Pins, Center.
Miner, W. H.

Pins, Coupler Knuckle.
McConway & Torley Co.
National Malleable & Steel Castings Co.

Pins, Crank.
American Locomotive Co.
Baldwin Locomotive Works
Miner, Inc., W. H.
Standard Steel Works Co.
Union Asbestos & Rubber Corp.

Pipe Coverings.
Carey & Co., Philip, The.
Johns-Manville Corp.

Pipe Fittings—(See Fittings, Pipe).

Pipe, Metal Culvert.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Republic Steel Corp.

Pipe, Steel Signal.
National Tube Co.

Pipe, Wrought Iron.
Byers Co., A. M.
Reading Iron Co.

Planers, Plate.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Plates.
Steel Car Forge Co.

Plates, Follower.
Steel Car Forge Co.

Plates, Boiler, Firebox—(See Steel Firebox).

Plates, Center—(See Bearings, Center).

Plates, Iron & Steel.
Armco Railroad Sales Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Plates, Tie.
Illinois Steel Co.
Inland Steel Company.
Railroad Supply Co.
Tennessee Coal, Iron & Railroad Co.

Plates, Tin and Terne.
American Sheet & Tin Plate Co.

Platforms, Car.
Gould Coupler Co., The.
Standard Coupler Co.

Platforms, Cast Steel, Passenger Car
General Steel Castings Corp.

Plows, Railroad and Grading.
Western Wheeled Scraper Co.

Plows, Snow.
American Locomotive Co.
Brill Co., The J. G.
Clark Tructractor Co.
Jordan Co., O. F.
Q & C Co., The.

Plugs, Arch Tube.
Prime Mfg. Co., The.

Plugs, Oil & Grease Cup.
Prime Mfg. Co., The.

Plugs, Washout.
Prime Mfg. Co., The.

Plush, Mohair.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Pneumatic Tools.
Ingersoll-Rand Co.

Poles.
Central Coal & Coke Co.
General Electric Supply Corp.
Graybar Electric Co.

Poles, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Poles, Signal.
General Railway Signal Co.
International Creosoting & Construction Co.
Union Switch & Signal Co.

Poles, Steel Tubular.
Graybar Electric Co.
National Tube Co.

Poles, Zinc Metal Arsenite Treatment.
Curtin-Howe Corp.

Posts, Fence.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Posts, Fence, Creosoted.
Inland Steel Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Posts, Steel Fence.
American Steel & Wire Co.
Q & C Co., The.

Powder, Blasting—(See Explosives).

Powdered Coal Equipment.
Muhlfeld, John E.

Power Plants.
General Electric Co.
Muhlfeld, John E.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Power Shovels.
American Hoist & Derrick Co.
Northwest Engineering Co.

Power Transmission Supplies.
Sellers & Co., Inc., Wm.
Wrought Iron Co. of America.

Preservatives, Wood.
Century Wood Preserving Co.
Jennison-Wright Co.

Presses, Flanging Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Presses, Hydraulic.
Birdsboro Steel Foundry & Mach Co.

Presses, Wheel.
Birdsboro Steel Foundry & Mach Co.
Sellers & Co., Inc., Wm.

Pulverizers, Coal — (See Crushers, Coal).

Pullshovels.
American Hoist & Derrick Co.

Pumping Stations.
Fairbanks-Morse & Co.

Pump Liners, Monel Metal.
International Nickel Co., The.

Pump Rods, Monel Metal.
International Nickel Co., The.

Pump Shafts, Monel Metal.
International Nickel Co., The.

Pumps, Hydraulic.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Pumps & Pumping Machinery.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Pumps, Vacuum.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Punching and Shearing Machines.
Ryerson & Son, Joseph T.

Pushers, Coal.
Standard Stoker Co.

Pyrometers, Superheated Steam.
Superheater Co., The.

Rail Anchors.
Bethlehem Steel Co.
P. & M. Co., The.

Rail-Bonds.
American Steel & Wire Co.
General Cable Corp.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Rail Braces — (See Braces, Rail).

Rail Cranes.
American Hoist & Derrick Co.

Rail Reclamation Equipment.
Ryerson & Son, Joseph T.

Railroad Shops.
United Engineers & Constructors, Inc.

Rail Splice Plates — (See Joints, Rail).

Railroad Structures — (See Engineers and Contractors; also Building).

Rails.
Bethlehem Steel Co.
Carnegie Steel Co.
Hyman-Michaels Co.
Illinois Steel Co.
Inland Steel Co.
Tennessee Coal, Iron & Railroad Co.
Thomson Rail Corp.

Rails, Relaying.
Hyman-Michaels Co.

Railway Signals.
General Electric Supply Corp.

Rattan.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Receivers, Air.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.

Recorders, Speed & Cut-off.
Valve Pilot Co.

Rectifiers for Signal Work.
General Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.

Reducing Valves.
Vapor Car Heating Co., Inc.

Reflectors, Headlight.
Sunbeam Electric Mfg. Co.

Refrigerators.
American Radiator Co
Wine Railway Appliance Co.

Regulators, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Relays.
General Railway Signal Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Removers, Paint & Varnish.
Oakite Products, Inc.

Repair Parts, Stoker.
Standard Stoker Co.
Q & C Company, The.

Retorts Creosoting.
Graver Tank & Mfg. Corp.

Reverse Gear, Power.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Rivet Cutters.
Ingersoll-Rand Co.

Riveters, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Riveting Machines.
Ingersoll-Rand Co.

Rivets.
Inland Steel Co.
Neely Nut & Bolt Co.
Ryerson & Son, Joseph T.
Pressed Steel Car Co.
Russell, Burdsall & Ward Bolt and Nut Co.

Rods.
Neely Nut & Bolt Co.

Rolled Steel.
Carnegie Steel Co.

Roller Bearings (See Bearings, Roller).

Rolls, Bending & Straightening.
Birdsboro Steel Foundry & Mach. Co.

Roof Slabs, Concrete.
Federal American Cement Tile Co.

Roofing, Asbestos.
Carey & Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.

Roofing, Buildings.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.

Roofing, Car.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey & Co., Philip, The.
Lehon Co., The.
Hutchins Car Rfg. Co.
Johns-Manville Corp.
Tuco Products Corp.
Union Metal Products Co.

Roofing, Corrugated.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey Co., Philip, The.
Johns-Manville Corp.

Roofing, Tile.
Federal American Cement Tile Co.

Roofing, Tile, Cement.
Federal American Cement Tile Co.

Roofing, Tin.
American Sheet & Tin Plate Co.

Rope, Wire — (See Wire Rope).

Rust Preventatives.
Dearborn Chemical Co.
Oakite Products, Inc.

Safe Ends.
National Tube Co.

Sand Drying Plants.
Roberts & Schaefer Co.

Sand Plants.
Railway Engineering Equipment Co.

Sanitary Products.
West Disinfecting Co.

Sash Balances.
Tuco Products Co.

Saws, Circular Metal.
Ryerson & Son, Joseph T.

Saws, High Speed, Friction.
Ryerson & Son, Joseph T.

Saws, Portable Rail.
Industrial Brownhoist Corp
Q & C Co., The.

Scales.
Fairbanks-Morse & Co.

Scrapers, Wheeled and Drag.
Western Wheeled Scraper Co.

Screens, Passenger Car.
Tuco Products Corp.

Seats, Car.
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seats, Coach.
Brill Co., The J. G.

Shafting.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.
Standard Steel Works Co.

Shapers.
Ryerson & Son, Joseph T.

Shapes, Pressed Steel.
Pressed Steel Car Co.
Sellers & Co., Inc., Wm.

Shapes, Structural.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheds, Train.
American Bridge Co.
Inland Steel Co.

Sheets, Black and Galvanized.
Allegheny Steel Co.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Blue Annealed.
Allegheny Steel Co.

Sheets, Car & Building.
American Rolling Mill Co.

Sheets, Corrugated.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Carnegie Steel Co.
Johns-Manville Corp.
Ryerson & Son, Joseph T.

Sheets, Corrugated and Plain.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheets, Electrical.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Iron & Steel.
Armco Railroad Sales Co.
Bethlehem Steel Co.

Sheets, Locomotive Jacket.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co
Inland Steel Co.

Sheets, Polished or Planished. Iron.
American Rolling Mill Co.
American Sheet & Tin Plate Co.

Sheets, Steel.
American Rolling Mill Co., The.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sherardising Plants.
General Electric Co.

Shop Calling Systems—(See Systems, Communication)

Shops, Railroad—(See Buildings, Iron, Steel and Steel Concrete).

Shovels & Draglines.
American Hoist & Derrick Co.
Industrial Brownhoist Corp

Shovels, Gasoline & Electric.
American Hoist & Derrick Co.

Shovels, Steam, Gasoline & Electric.
American Hoist & Derrick Co.
Orton Crane & Shovel Co.

Siding, Bldg., Car, Corrugated & Plain.
Kinnear Mfg. Co.
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Inland Steel Co.

Siding, Corrugated & Plain.
Carey & Co., Philip, The.
Johns-Manville Corp.

Siding, Iron & Steel.
American Rolling Mill Co.

Signal Accessories.
Electric Storage Battery Co.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Signals, Automatic Cab.
General Railway Signal Co.
Union Switch & Signal Co.

Signal Blades.
General Railway Signal Co.
Union Switch & Signal Co.

Signals, Crossing.
Union Switch & Signal Co.

Signals, Crossing Protection.
General Railway Signal Co.
Railroad Supply Co.

Signals, Railway.
General Electric Co.
Union Switch & Signal Co.

Signs, Highway Crossing.
Railroad Supply Co.

Silico Manganese.
Vanadium Corp. of America

Silicon.
Electro Metallurgical Sales Corp.

Slabs, Concrete Floor.
American Cement Tile Mfg. Co.
Federal Cement Tile Co.

Slag, Blast Furnace.
Carnegie Steel Co.

Slotting Machines.
Sellers & Co., Inc., Wm

Slotting Machines, Locomotive Cylinder.
American Steel & Wire Co.

Sludge Removers.
Bird-Archer Co., The.

Soap, Liquid.
West Disinfecting Co.

Snow Plows.
Jordan Co., O. F.

Solder.
National Bearing Metals Corp.
Westinghouse Elec. & Mfg. Co.

Speed Indicators & Recorders.
Valve Pilot Corp.

Spelter—(See Zinc).

Spikes.
American Steel & Wire Co.
Bethlehem Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Splice Bars, Angle.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.

Spreaders, Ballast.
Jordan Co., O. F.

Spring, Plates or Seats.
Allegheny Steel Co.
National Malleable & Steel Castings Co.
Union Spring & Mfg. Co.

Springs.
American Steel Foundries Co.
American Steel & Wire Co.
Railway Steel Spring Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Switch & Signal Co.

Springs, Shop Equipment.
Ryerson & Son, Joseph T.

Springs, Vanadium Steel.
Union Spring & Mfg. Co.

Stacks, Steel.
American Bridge Co.
Graver Tank & Mfg. Corp.

Stands, Switch & Target.
Q & C Co., The.

Staybolts.
American Locomotive Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Flannery Bolt Co.
Ryerson & Son, Joseph T.

Staybolts, Hollow.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Steam Chests.
Franklin Railway Supply Co., Inc.

Steam Enclosures, Corrugated Iron.
Republic Steel Corp.

Steam Shovels.
American Hoist & Derrick Co.
Orton Crane & Shovel Co.

Steel Alloy.
Illinois Steel Co.
Ryerson & Son, Joseph T.
Republic Steel Corp.
Standard Steel Works Co.

Steel, Firebox.
Carnegie Steel Co.
Illinois Steel Co.

Steel & Iron, Stainless.
Allegheny Steel Co.

Steel, Open Hearth.
Carnegie Steel Co.
Illinois Steel Co.

Steel Plate Construction.
Graver Tank & Mfg. Corp.

Steel, Pressed Specialties.
Hale-Kilburn Co.

Steel, Structural.
American Bridge Co.
Carnegie Steel Co.
Graver Tank & Mfg. Corp.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Steel, Tool.
Illinois Steel Co.
Midvale Co., The.
Q & C Co., The.
Ryerson & Son, Joseph T.

Step Joints.
Q & C Co., The
Rail Joint Co.

Steps, Car—(See Car Steps, Safety).

Stokers, Locomotive.
Standard Stoker Co.

Stokers, Mechanical.
Westinghouse Elec. & Mfg. Co.

Stoker Repair Parts.
Standard Stoker Co.

Storm Sewers, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Strainer, Air.
Westinghouse Air Brake Co.

Strainers, Tank Hose.
Prime Mfg. Co., The.

Stream Enclosures, Corrugated Iron.
Armco Culvert Mfrs. Assoc.

Stringers, Bridge.
Central Coal & Coke Co.
Century Wood Preserving Co.
International Creosoting & Construction Co.

Stringers, Bridge, Creosoted.
Century Wood Preserving Co.
National Lumber & Creosoting Co.

Structural Shapes, Rolled Shapes.
Carnegie Steel Co.

Superheaters.
Superheater Co., The.

Supports, Bottom Rod Safety.
Chicago Railway Equipment Co.

Switch Boards.
Graybar Electric Co.
Johns-Manville Corp.
Westinghouse Elec. & Mfg. Co.

Switch Machines.
General Railway Signal Co.

Switch Movements.
Union Switch & Signal Co.

Switch Ties.
International Creosoting & Construction Co.

Switch Ties, Creosoted.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Switches, Electric.
Electric Service Supplies Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Switches & Switch Stands.
Ramapo Ajax Corp.

Syphons, Corrugated Iron.
Armco Culvert Mfrs. Association.
Republic Steel Corp.

Syphons, Locomotive.
Locomotive Firebox Co.

Syphons, Locomotive, Boilers
Locomotive Firebox Co.

Tables, Welding.
Oxweld Railroad Service Co., The.

Tables, Welding.
Oxweld Railroad Service Co., The.

Tamping Machines, Tie.
Ingersoll-Rand Co.

Tamping Outfits, Tie.
Ingersoll-Rand Co.

Tanks, Acetylene, Gas.
Oxweld Railroad Service Co., The.

Tanks, Air, Gas, Oil and Water.
Graver Tank & Mfg. Corp.

Tanks, Water.
American Bridge Co.
American Locomotive Co.
National Tube Co.
Pressed Steel Car Co.
Westinghouse Air Brake Co

Tape, Insulation.
Johns-Manville Corp.
Okonite Co., The.
Westinghouse Elec. & Mfg. Co.

Taps, Staybolt.
Ryerson & Son, Joseph T.

Tele. & Tele. Wire.
Anaconda Wire & Cable Co.
General Cable Corp.
General Electric Supply Corp.

Terminals, Railroad.
United Engineers & Constructors, Inc.

Testers, Boiler.
Sellers & Co., Inc., Wm.

Testers, Gage.
Ashton Valve Co.

Testers, Rail.
Sperry Products, Inc.

Thermostats.
Vapor Car Heating Co., Inc.

Throttles.
American Throttle Co.

Tie Plates.
Bethlehem Steel Co.
Illinois Steel Co.
Railroad Supply Co.

Ties, Creosoted.
International Creosoting & Construction Co.
Jennison-Wright Co.
National Lumber & Creosoting Co.

Ties, Steel.
American Bridge Co.
Bethlehem Steel Co.
Carnegie Steel Co.

Ties, Wood.
Curtin-Howe Corp.
International Creosoting & Construction Co.

Tile, Cement, Concrete.
Federal American Cement Tile Co.

Timber.
Central Coal & Coke Co.
Curtin-Howe Corp.

Tires.
Firestone Tire & Rubber Co.
General Tire & Rubber Co.
Goodyear Tire & Rubber Co.
Goodrich Rubber Co., B. F.

Timber, Creosoted.
Century Wood Preserving Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Tires, Steel.
Edgewater Steel Co.
Midvale Co., The.
Railway Steel Spring Co.
Standard Steel Works Co.

Tools, High Speed Steel.
Bethlehem Steel Co.
Bird-Archer Co., The.

Towers, Floodlight.
Pyle-National Co.

Track Skates.
Q & C Co., The.

Tractors.
Caterpillar Tractor Co.
Elwell-Parker Electric Co.
Industrial Lumber Co.
International Creosoting & Construction Co.

Tractors, Industrial.
Elwell-Parker Electric Co.
International Harvester Co.

Tractors, Turntable.
Nichols & Bros., Geo. P.

Train Control Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Tramways, Wire Rope.
American Steel & Wire Co.

Transfer Tables.
American Bridge Co.
Industrial Brownhoist Corp.
Nichols & Bros., Geo. P.

Transformers.
General Electric Supply Corp.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Trap Doors.
Edwards Co., O. M.

Trap Doors & Fixtures.
Tuco Products Corp.

Traps, Steam.
Johns-Manville Corp.

Treads, Bridge Floor.
Carnegie Steel Co.

Treads, Safety.
Ryerson & Son, Joseph T.

Treatment, Water—(See Water Softening and Purifying).

Truck Frames—(See Frames, Truck).

Trucks, Oxy-Acetylene Supply.
Oxweld Railroad Service Co., The.

Trucks, Car.
St. Louis Car Co.

Trucks, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Bettendorf Company, The.
Birdsboro Steel Foundry & Mach. Co.
Brill Co., The J. G.
Flexible Truck Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
St. Louis Car Co.
Standard Car Truck Co.
Symington Co., The.

Trucks, Cast Steel Tender
General Steel Castings Corp.

Trucks, Cast Steel, Electric Car
General Steel Castings Corp.

Trucks, Cast Steel, Car & Locomotive
General Steel Castings Corp.

Trucks, Dump.
Clark Tructractor Co.

Trucks, Electric Storage Battery.
Elwell-Parker Electric Co.

Trucks, Industrial.
Elwell-Parker Electric Co.

Trucks, Motor.
Dodge Motor Truck Corp.
General Motors Truck Co.
International Harvester Co.
Reo Motor Car Co.
White Co., The.

Trucks, Tender.
Flexible Truck Co.

Trucks, Trailer.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.

Tubes, Arch.
National Tube Co.

Tubes, Boiler.
Allegheny Steel Co.
Bethlehem Steel Co.
National Tube Co.
Ryerson & Son, Joseph T.

Tubes, Boiler, Charcoal Iron.
Bethlehem Steel Co.
Reading Iron Co.

Tubes, Staybolt.
Falls Hollow Staybolt Co.

Tubes, Tire.
Firestone Tire & Rubber Co.
Goodyear Tire & Rubber Co.

Tubing.
Aluminum Co. of America.

Tubing, Seamless Steel.
National Tube Co.

Tungsten Metal.
Vanadium Corp. of America.

Turbo Generators.
Electric Service Supplies Co.
General Electric Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Turnbuckles.
American Bridge Co.
American Steel & Wire Co.
Ryerson & Son, Joseph T.

Turntable Tractors.
Nichols & Bros., Geo. P.

Turntables.
American Bridge Co.
Industrial Brownhoist Corp.

Typewriter Ribbons.
Remington-Rand Business Service.

Typewriters.
Remington-Rand Business Service.

Uncoupling Device.
Hutchins Car Rfg. Co.

Undercrossings, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Underfloor Duct.
General Electric Supply Corp.

Underfloor Duct, Fibre and Metal.
Johns-Manville Corp.

Underframes, Cast Steel. Tender
General Steel Castings Corp.

Underframes, Cast Steel, Freight Car.
General Steel Castings Corp.

Underframes, Steel.
Bettendorf Co., The.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Underground Conduit.
General Electric Supply Corp.

Upholstery, Car.
Brill Co., The J. G.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Valve Gears, Locomotive.
Pyle-National Co.

Valves, Air Brake.
Westinghouse Air Brake Co.

Valves, Back Pressure Acetylene.
Oxweld Railroad Service Co., The.

Valves, Blow-Off.
Bird-Archer Co., The.

Valves, Check & Angle Steam
Sellers & Co., Inc., Wm.

Valves, Drifting.
Ardco Mfg. Co.
Sellers & Co., Inc., Wm.

Valves, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Valves, Piston.
Franklin Railway Supply Co., Inc.

Valves, Pop, Safety & Relief.
Ashton Valve Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

Valves, Pressure Regulating
Gold Car Htg. & Ltg. Co.

Valves, Throttle.
Bradford Corporation.

Vanadium.
Electro Metallurgical Sales Corp.

Varnish Powder.
Aluminum Co. of America.

Varnishes.
du Pont de Nemours & Co., Inc., E. I.
General Electric Supply Corp.
Sherwin-Williams Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Ventilators, Car
Gold Car Htg. & Ltg. Co.

Ventilators, Shop & Roundhouse.
Carey Co., Philip, The.
Johns-Manville Corp.

Wardrobes, Rolling and Disappearing Front — (See Lockers).

Washers.
National Malleable & Steel Castings Co.
Reliance Mfg. Co.
Ryerson & Son, Joseph T.
Wine Railway Appliance Co.

Washers, Boiler.
Sellers & Co., Inc., Wm.

Washers, Lock.
Reliance Manufacturing Co., The.

Water Alarms — (See Low Water Alarms).

Waterproofing Materials and Compounds.
Carey Co., Phillip, The.
Lehon Co., The.
Johns-Manville Corp.

Water Purifying Materials & Compounds.
Bird-Archer Co., The.
Dearborn Chemical Co.

Water Softening & Purifying.
Bird-Archer Co., The.
Dearborn Chemical Co.
Graver Tank & Mfg. Corp.

Weather Stripping.
Tuco Products Corp.

Wedges, Automatic.
Franklin Railway Supply Co., Inc.

Wedges, Journal Box.
American Steel Foundries.
Gould Coupler Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Company.
Symington Co., The.

Weed Killer.
Q & C Co., The.

Welding Machines, Acetylene.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

Welding Machines, Electric.
General Electric Co.
Ryerson & Son, Joseph T.

Welding Machines, Flue.
Ryerson & Son, Joseph T.

Welding Materials.
Oxweld Railroad Service Co.
Franklin Railway Supply Co., Inc.

Welding Process.
Oxweld Railroad Service Co.

Welding Rods.
American Steel & Wire Co.
General Electric Supply Corp.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.

Welding Supplies.
General Electric Co.
Oxweld Railroad Service Co., The.

Welding and Cutting Apparatus—(See Cutting and Welding Apparatus).

Well Casings, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Wheel Centers, Driving.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Birdsboro Steel Foundry & Mach. Co.
Edgewater Steel Co.
Hunt-Spiller Mfg. Corp.
Standard Steel Works Co.
Union Steel Casting Co.

Wheels, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Bethlehem Steel Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Railway Steel Spring Co.
Standard Steel Works Co.

Wheels, Cast Iron, Chilled Tread.
Assn. of Mfrs. of Chilled Car Wheels.
Graybar Electric Co.
Griffin Wheel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Wheels, Mine Car.
Carnegie Steel Co.
Edgewater Steel Co.
Mt. Vernon Car Mfg. Co.
Standard Steel Works Co.

Wheels, Passenger Car.
Carnegie Steel Co.
Illinois Steel Co.
Edgewater Steel Co.
Pullman Car & Mfg. Corp.
Standard Steel Works Co.

Wheels, Steel and Steel Tired
American Locomotive Co.
American Steel Foundries.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Lima Locomotive Works.
Railway Steel Spring Co.
Standard Steel Works Co.

Wheels, Wrought Steel.
American Rolling Mill Co.
Bethlehem Steel Co.
Carnegie Steel Co.
Edgewater Steel Co.
Standard Steel Works Co.

Whistles.
Ashton Valve Co.

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Westinghouse Air Brake Co.

Window Fixtures.
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Windows, Locomotive Cab, Clear Vision.
Prime Manufacturing Co.

Windshield Wings, Loco.
Prime Mfg. Co., The.

Wire.
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General Cable Corp.
Kerite Insulated Wire & Cable Co.
Okonite Co., The

Wire, Fence.
American Steel & Wire Co.

Wire, Insulated.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Cable Corp.
General Electric Co.
Graybar Electric Co.
Kerite Insulated Wire & Cable Co.
Okonite Co., The.

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American Steel & Wire Co.
General Cable Corp.
Graybar Electric Co.

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American Hoist & Derrick Co.

Wire Rope.
American Steel & Wire Co.

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American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Cable Corp.
Graybar Electric Co.

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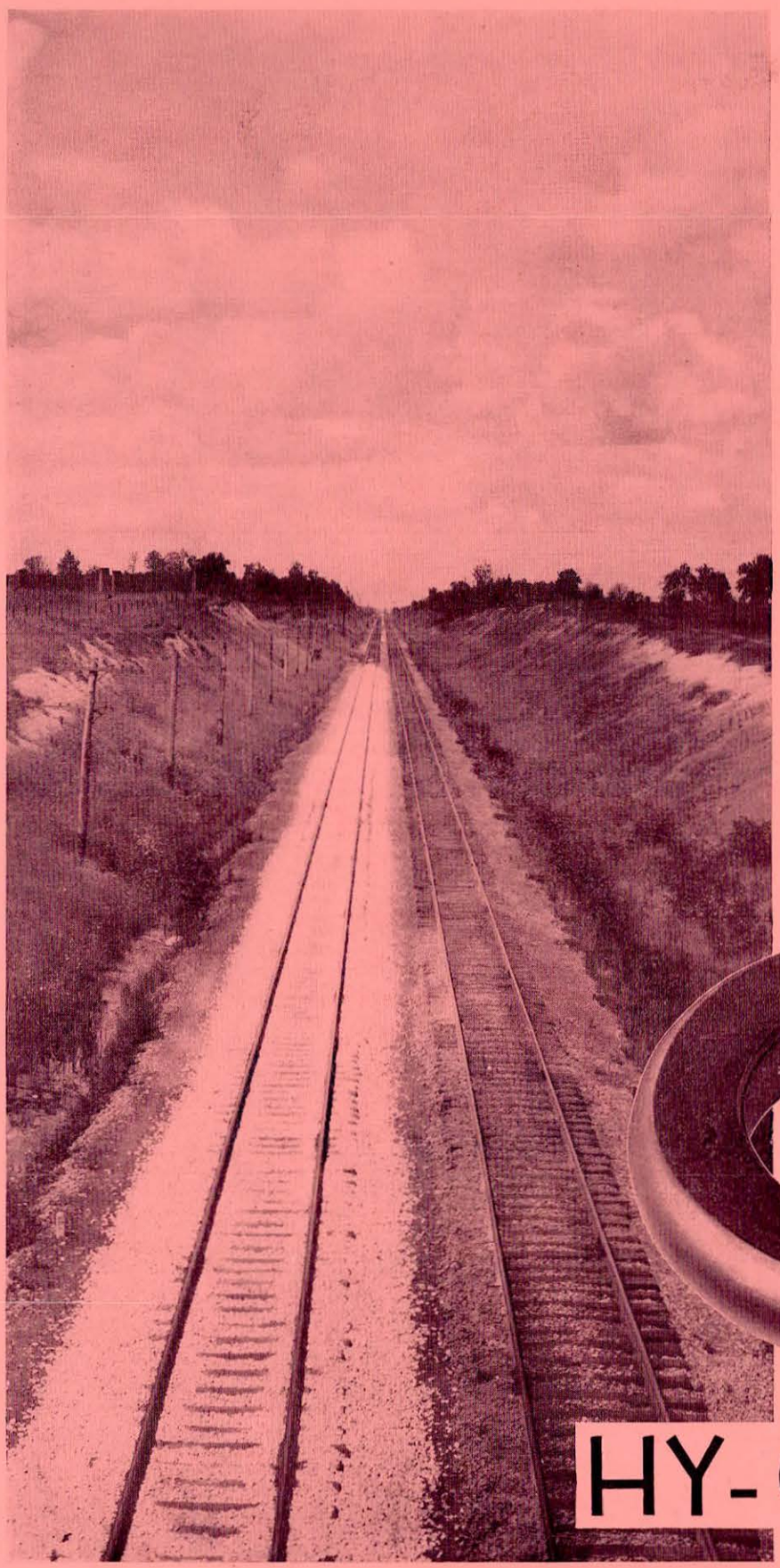

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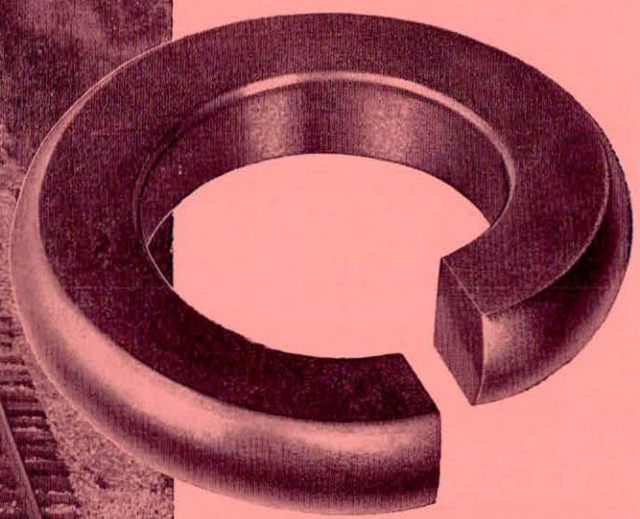

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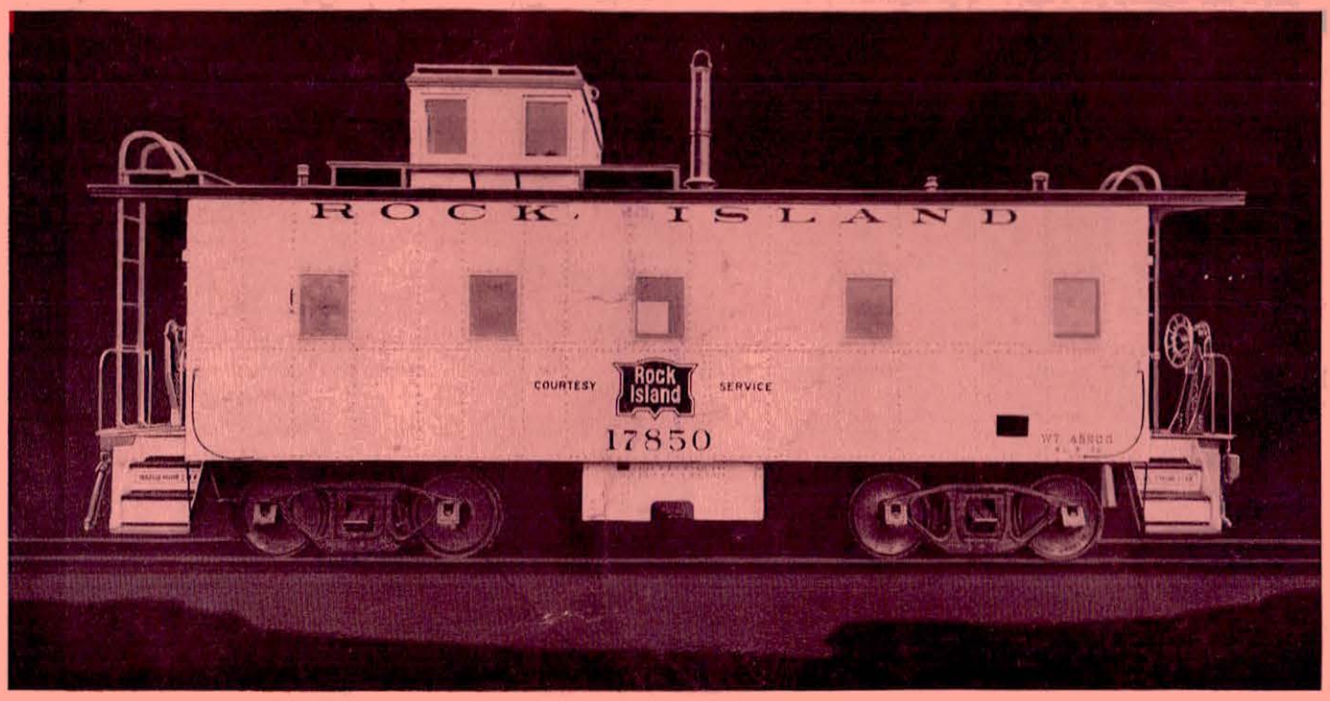

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